

AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

MAY 1, 1955

In This Issue

- Automotive Mergers and the Monopoly Myth
- Semi-Production Setup for J-57 Turbojets
- Design Features of New Disk-Type Brake
- Automatic Transmissions in the Economy Run
- Mass Production of Volkswagen Torsion Bars
- New Techniques for Making Tubeless Tires

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A CHILTON PUBLICATION

STANDARD technical service

clicks at Argus Camera

Personnel at Argus Camera Company were having trouble with the grinding of thread plug gauges. Grinding oils used failed to hold the required accuracy. They called in L. H. Walker, Standard Oil industrial lubrication specialist. He recommended Standard's SUPERLA Thread Grinding Oil A, and Argus began using it. That was four years ago. What happened? SUPERLA Thread Grinding Oil has helped Argus grind thread plug gauges with such accuracy, so consistently, that rejects are virtually eliminated.

Small job? Yes. Small volume of oil used? Yes. But the results are big business to Argus Camera. That makes it important to Standard Oil. It is another demonstration of what this unbeatable combination can do when put to work:

- 1 Standard lubrication specialists capable of giving technical help.
- 2 Top quality products that deliver results required.

Put this combination to work in your plant. In the Midwest there is a lubrication specialist in your nearby Standard Oil office ready to help you. Call him. Or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

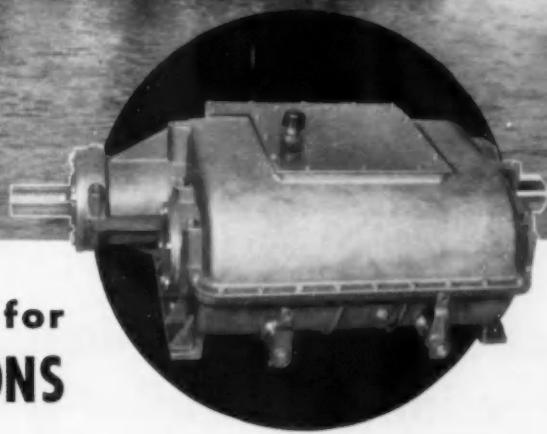
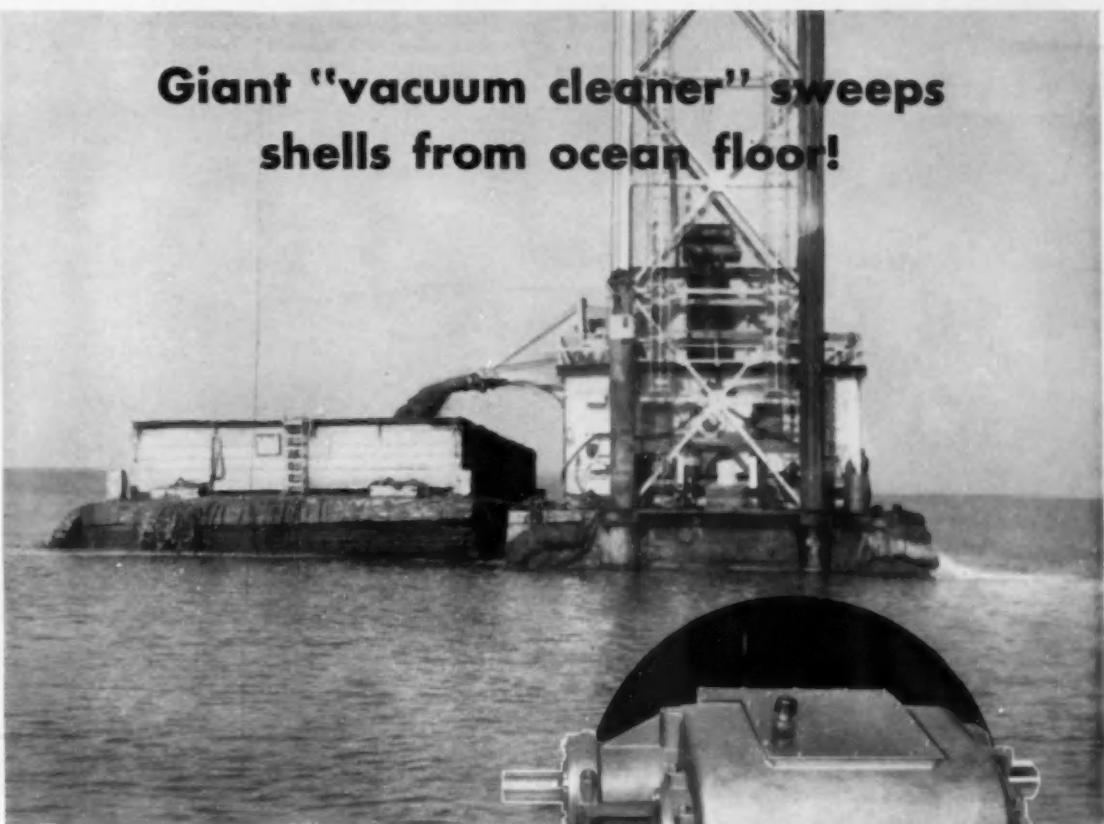


Omer L. Parks (left), tool and gauge grinder for Argus Camera, inspects thread plug gauge with L. H. Walker, Standard Oil Industrial engineer. Lyman Walker has been working with customers for 25 years helping them solve problems like the one at Argus. A native of Detroit, Lyman Walker is familiar with the lubrication problems of industry in the territory he serves. This together with his wide experience makes him ideally qualified for this work. Customers find his experience pays off for them.



STANDARD OIL COMPANY
(Indiana)

Giant "vacuum cleaner" sweeps shells from ocean floor!



Another "rugged" job for **COTTA TRANSMISSIONS**

Here's how Cotta Transmissions are used with modern Diesel engines.

Cotta's Model GNR Reduction Gear is used between a 400 hp engine and dredge pump . . . replacing a Diesel-electric drive . . . modernizing and speeding operation of the dredge used for pumping oyster shells out of San Francisco Bay for the manufacture of cement.

For continuous heavy-duty operation and power

transmission jobs ordinary gear boxes can't handle — requiring Single Speed Reduction Units or Multi-Speed forward and reverse — come to Cotta for "engineered-to-order" transmissions, designed to fit available space. Thousands in operation throughout the United States and foreign countries . . . on a wide variety of jobs . . . (on cranes, locomotives, drillers, shovels, etc.) . . . under all types of *tough conditions*. Input torque from 150 to 2500 ft. lbs.

THIS INFORMATION WILL HELP YOU

Diagrams, capacity tables, dimensions, and complete specifications sent free on request. Just state your problem—COTTA engineers will help you select the right unit for best performance. May we work with you?

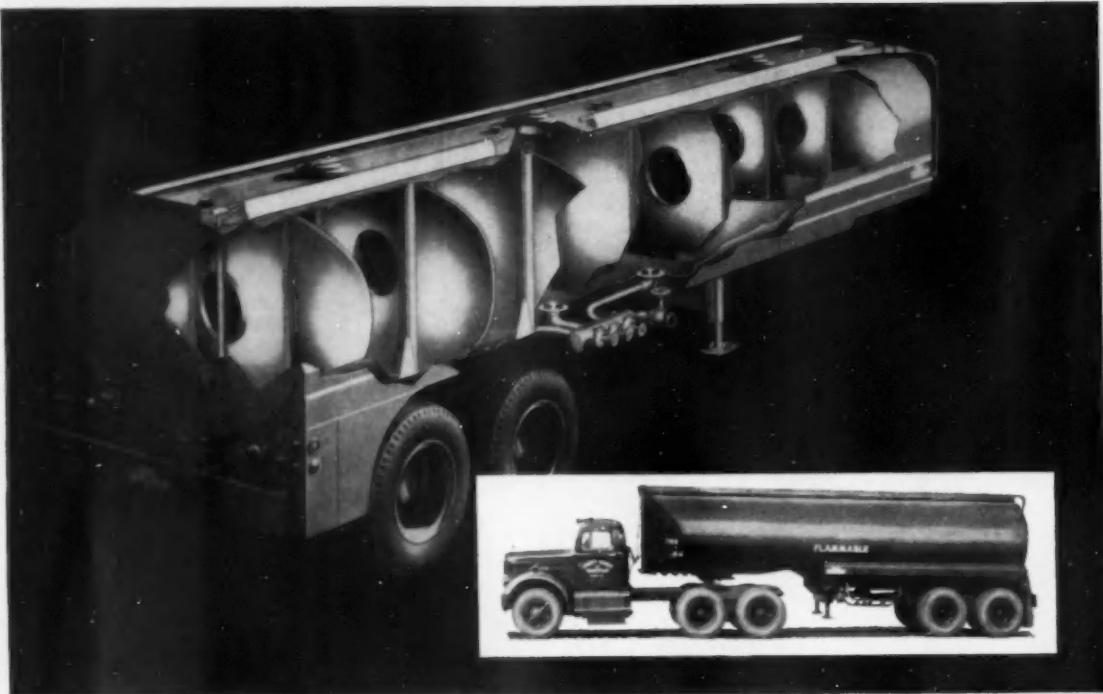
COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS



COTTA
HEAVY-DUTY
TRANSMISSIONS

"Engineered-to-order"

Cutaway illustration of "trailerized" tank for petroleum trailer manufactured by The Heil Co., Milwaukee, Wis. and Hillside, N. J., and utilizing "Mayari R," a high strength, low alloy nickel steel produced by Bethlehem Steel Co., Bethlehem, Pa.



Users of Heil "trailerized" tankers find that every pound of deadweight trimmed off not only saves fuel, but also lessens wear on tires and brakes. This means lower operating cost and higher revenue per ton mile.

Nickel alloy helps designer eliminate trailer tank frame

Payload increased and deadweight cut by utilizing high strength, low alloy steel containing nickel

SIMPLIFIED DESIGN of this tanker eliminates not only the frame but also many supporting members ordinarily used in trailer tanks.

The manufacturer, The Heil Co., trims off 20 per cent in deadweight, yet increases the payload capacity of these units without sacrificing safety or increasing axle loading.

Capacity is safely increased by using tank shells, baffles, and deep-dished heads that have ample strength for the greater load because they are made of a high strength, low alloy steel containing nickel.

Heil uses a Bethlehem Steel Company product known as "Mayari R." Steels of this type in thin, light sections, provide the same strength and

safety as thicker, heavier sections of plain carbon steel. These steels also respond readily to fabrication, including welding and cold forming.

They give you other advantages, too. Their greater resistance to impact, wear and abrasion lengthens the life of structures subject to hard usage. And you get obvious benefits from the superior resistance they offer to atmospheric and many other types of corrosion.

Produced under a variety of trade names by leading steel companies, high strength, low alloy steels containing nickel along with other alloying elements are widely used in automotive and allied fields.

Investigate how you can cut needless weight, yet increase the payload capacity of your vehicles. Write us today for your copy of the publication "High-Strength Low-Alloy Steels."



THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street
New York 5, N.Y.

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE PUBLISHED SEMI-MONTHLY

MAY 1, 1955

VOL. 112, NO. 9

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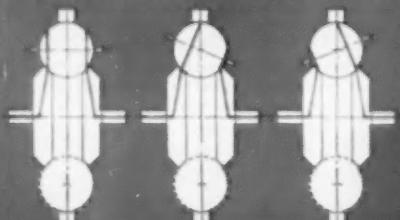
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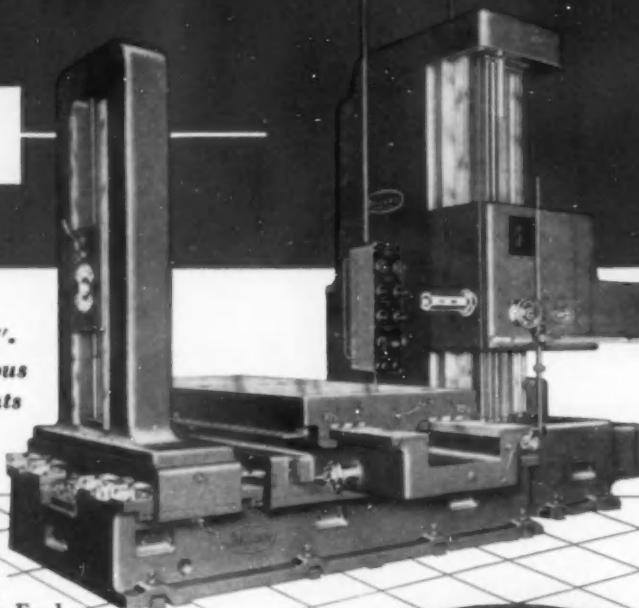
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RIGIDITY — is built into the massive 4-Way Bed, Head, Headpost and Rear Post assuring a higher degree of maintained accuracy.

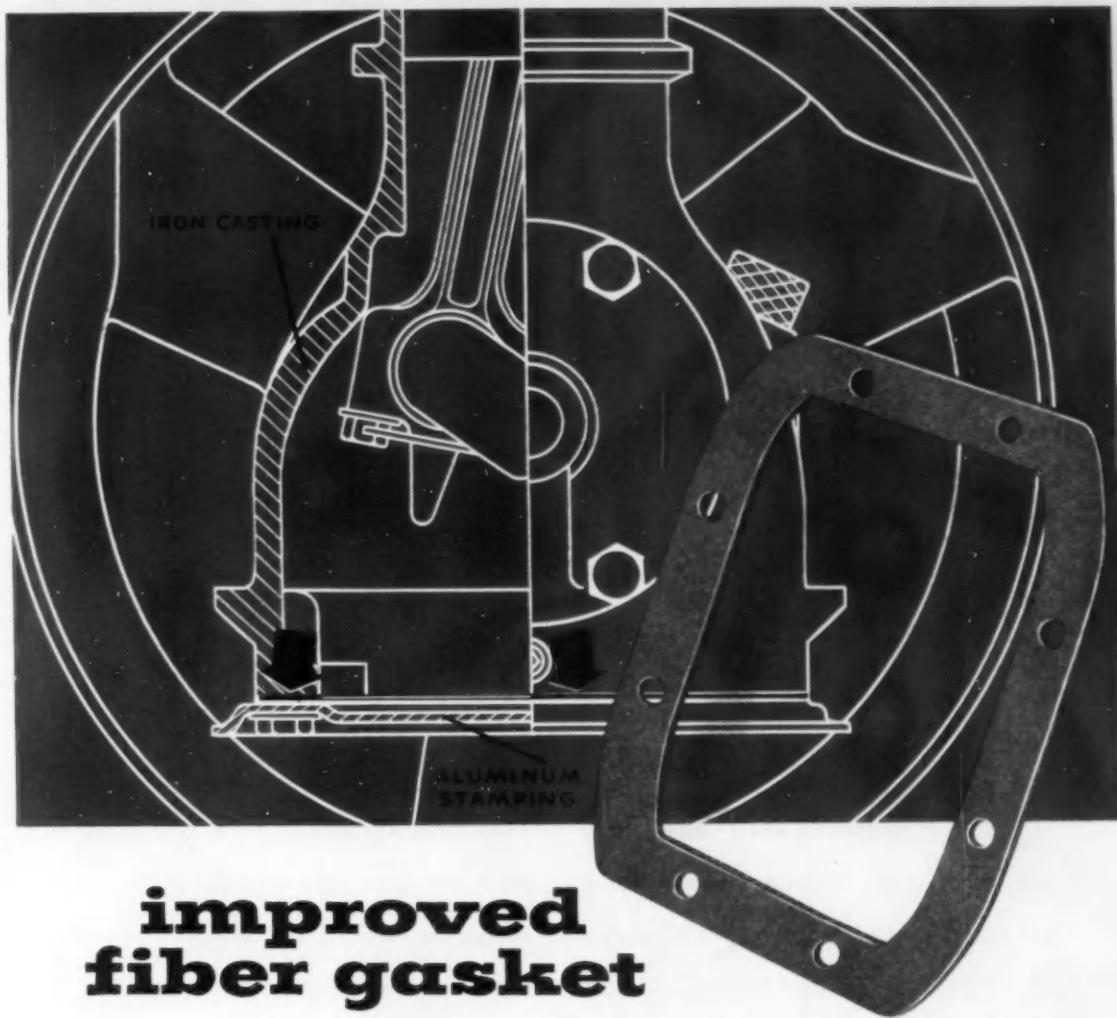
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improved fiber gasket

won't dry out or shrink, stops oil leaks

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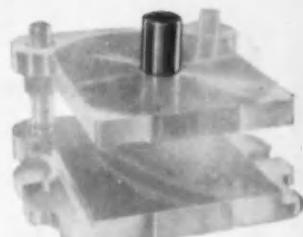
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3 different punch holder thicknesses



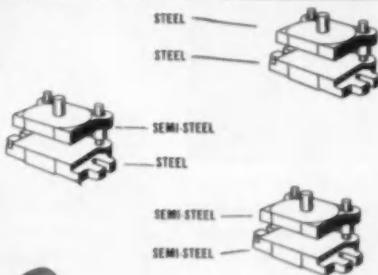
3 different die shoe thicknesses



6 shank size variations



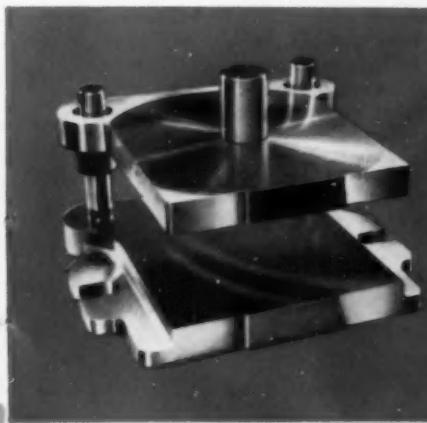
4 bushing type variations



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16 guide post lengths in each of
3 different styles to choose from



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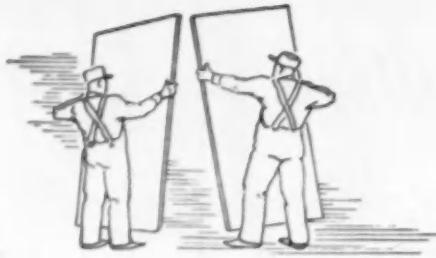
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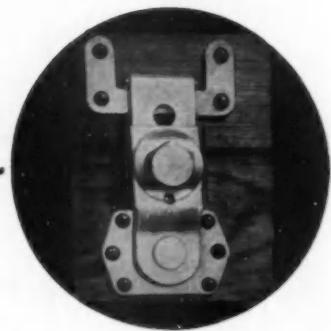
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Where can you use it? When you need heavy fastening pressures, resistance to impact, operation in 70°-below temperatures—and where ease of action, compactness, and low cost are important factors. Write for a No. 1 LINK-LOCK Data Sheet.

SIMMONS FASTENER CORPORATION
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QUICK-LOCK SPRING-LOCK ROTO-LOCK LINK-LOCK DUAL-LOCK

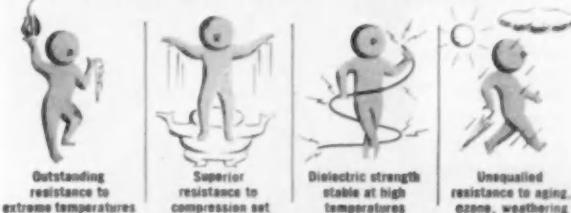
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| <input type="checkbox"/> O-rings | <input type="checkbox"/> Reinforced ducting, hose |
| <input type="checkbox"/> Molded boots, sleeves, bellows | <input type="checkbox"/> Sheets and blankets |
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Name _____ Position _____

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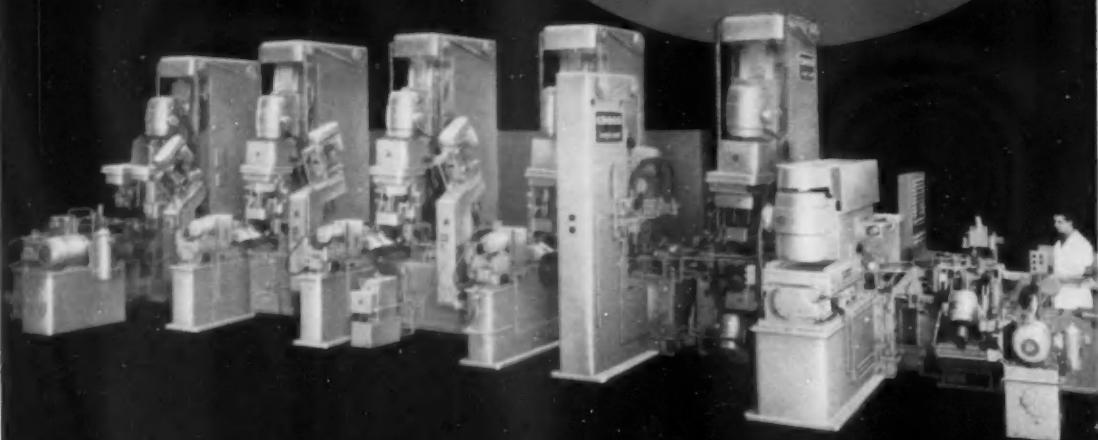
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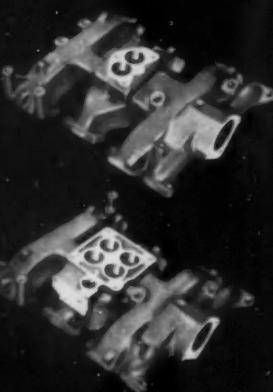
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Another Transfer-matic by Cross

**Mills, Drills,
Bores, Taps,
2 and 4 Barrel
Intake Manifolds**



- ★ Rough and finish mills carburetor pad; mills choke pad (4 barrel only); bores carburetor port holes; drills and chamfers all holes (except 3 holes in water outlet pad); and taps all holes.
- ★ 140 pieces per hour at 100% efficiency.
- ★ Initial part location from port openings.
- ★ Push-button changeover from 2 to 4 barrel carburetor.
- ★ 13 stations; 1 loading, 11 working, 1 unloading.
- ★ Lift-and-carry type transfer mechanism.
- ★ Pre-set tooling throughout.
- ★ Other features: construction to J.I.C. standards; complete interchangeability of all standard and special parts for easy maintenance; hardened and ground ways; drag chain type chip conveyor.



Established 1898

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DETROIT 7, MICHIGAN
Special MACHINE TOOLS

One Waldes Truarc Ring Saves a Pound in Weight Replaces Cast Retainer Plate and Four Screws

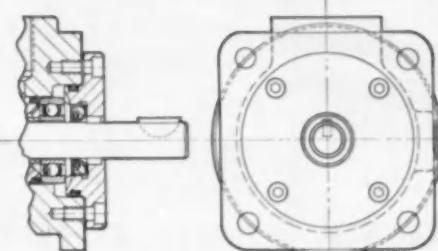
Denison Vane Type Pump/Motor



The Denison Engineering Company of Columbus, Ohio uses a Waldes Truarc Beveled Retaining Ring (Series 5002) in their pump/motor to achieve a simpler, lighter, more easily assembled unit and to cut both material costs and production time.

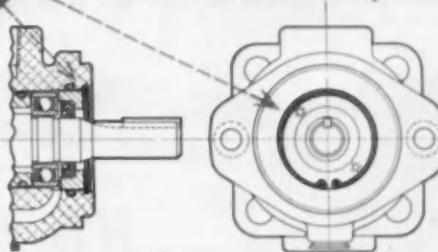
This vane-type power package operates as either a fluid pump or motor without alterations of any kind. Built for 2000 psi continuous duty, rugged construction was essential.

Shaft Seal Subassembly



Experimental Way: One cast retainer plate plus four socket head cap screws hold unit together. Assembly requires skilled labor, machinery, time-consuming careful adjustment.

Shaft Seal Subassembly



Truarc Way: Waldes Truarc beveled retaining ring (internal 5002) retains shaft and bearings, takes up accumulated tolerances rigidly, prevents leakage around shaft. Unit is one pound lighter. Assembly is quick and easy, more economical.

Wherever you now use machined shoulders, bolts, snap rings, or cotter pins, there's a Waldes Truarc Retaining Ring designed to do a better, more economical job. Truarc Rings are precision engineered, quick and easy to assemble and disassemble.

More than 5,000 stock-sizes of the different Truarc

ring types available. Ninety stocking points throughout U. S. A. and Canada.

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WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,166; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,061; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.

→ Waldes Kohinoor, Inc., 47-16 Astoria Place, L. I. C. 1, N. Y.
Please send the new supplement No. 1 which brings Truarc Catalog RR 9-52 up to date.

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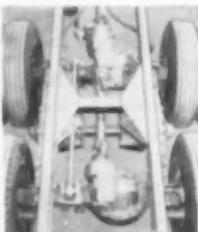
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BUT NOT FOR LONG!



***White* trucks keep rolling
for profits—with long-lived
BLOOD BROTHERS propeller shafts**



Rugged, reliable White trucks are famous for their ability to pile up long miles of profitable road time . . . on very little shop time!

Contributing to this record of low ton-mile cost are the rugged Blood Brothers Propeller Shafts. Precision-balanced for high speed trucks and buses, they're top-quality components that can help keep *any* fleet earning!

Blood Brothers' engineers will gladly discuss *your* universal joint and propeller shaft problems. Just write or call . . . no obligation.



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MACHINE DIVISION**
ROCKWELL SPRING AND AXLE COMPANY
ALLEGAN, MICHIGAN

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A COMPLETE LINE OF

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Your Delpark representative has the
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FAMOUS DELPARK DISPOSABLE MEDIA FILTER

For filtration of coolants, cutting oils,
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and all liquids.

Unlimited Capacities.



DELPARK ROTO-GRAVITY FILTER

For continuous removal of fine
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FULL FLOW,
SELF CLEANING,
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Capacities to 150 g.p.m.

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For removal of metal particles which respond
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For pre-filtration
or independently.

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No chain conveyor
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Simplified design assures
trouble-free operation.

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For small flow filtration of grinding
fluids and cutting oils.

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FULL FLOW,
EFFICIENT,
ECONOMICAL



Capacities 1/4-1 1/2 g.p.m.

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INDUSTRIAL FILTRATION

Backed by more than 40 years experience
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DELPARK SCREEN-TYPE FILTER

For filtration of liquids of varying degrees of
viscosity containing solids of different particles,
sizes and widely differing weights.



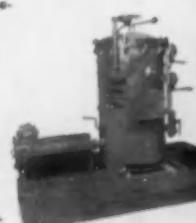
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FULLY AUTOMATIC

Unlimited Capacities.

DELPARK-OLSON SUPERFLOW FILTER

The original tubular pre-
coat filter using dia-
maceous earth. Does
not affect additives.

FULL FLOW,
SELF CLEANING,
CONTINUOUS,
FULLY AUTOMATIC



Capacities to 175 g.p.m.

U. S. PAT. NO.
2,693,282

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is available on all of these
Delpark Filters.

Write today
specifying units on which you
desire more information.



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IN THE REALM OF FORGING
DESIGN AND THE DEVELOPMENT
OF PROPER GRAIN-FLOW, WYMAN-
GORDON HAS ORIGINATED MANY
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TIME OF THEIR DEVELOPMENT
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One man,
one **DENISON**
MULTIPRESS®
... 9 times
the production
per man

At Barber-Greene Company, they've tripled production for riveting together two halves of a ring gear assembly.

With former hot rivet method, the best a three-man team could do was 10 assemblies an hour. The operation was slow, noisy. Distortion from heat made a boring operation necessary.

With cold riveting, using Denison's hydraulic Multipress, flow of metal is better, more uniform. There's no heat, no warpage. One operator rivets 30 assemblies an hour.

You can get the same results. Send for bulletins and case studies on applications in the one to 75-ton pressure range. Write to:

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DENISON ENGINEERING COMPANY
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HYDRAULIC PRESSES
MOTORS • PUMPS • CONTROLS

Welding Set-Ups Switched in Seconds

with the
MALLORY
"Nu-Twist"[®]
Die Adaptor

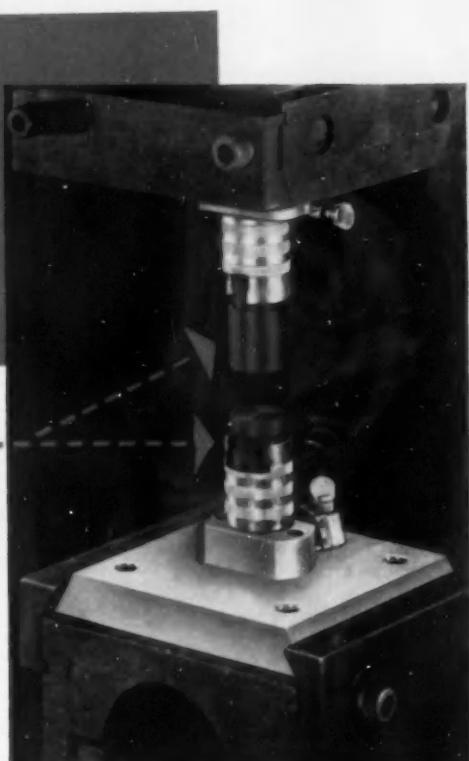


PUT this time-saving idea to work in your resistance welding production, and you will eliminate many precious minutes of changeover time.

The Mallory "Nu-Twist" Die Adaptor lets you switch set-ups *in only seconds*. A single die accommodates different electrode inserts. Just turn the adaptor nut, slide out the electrode insert, set in a different one, tighten, and you have a completely new set-up.

Especially valuable for short-run production, "Nu-Twist" gives you practically instantaneous changeovers between projection, spot, mash welding and electrical upsetting. It cuts your inventory, too; all you need is one adaptor and as many different inserts as your production requires.

To fit your welding machine, we supply eight different styles of die adaptor bases, machined to your specifications. Notable among these is the new *Short* "Nu-Twist"



Die Adaptor Base, which provides exceptionally small height to go into limited machine space. In addition, our engineers will be glad to design special bases and electrode inserts for your particular requirements.

See your nearby Mallory welding distributor for complete information, or write to Mallory for your copy of our latest Catalog that lists the full line of Mallory resistance welding electrodes, holders, seam welding wheels, forgings and accessories.

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry Street, Toronto 15, Ont.

**Expect more . . .
get more from**



STOCK ELECTRODES

Hundreds of shapes and sizes are available in stock . . . with round water holes or the exclusive Mallory fluted cooling hole for longer life between dressings. Save you both cost and delivery time.

STANDARD ELECTRODES

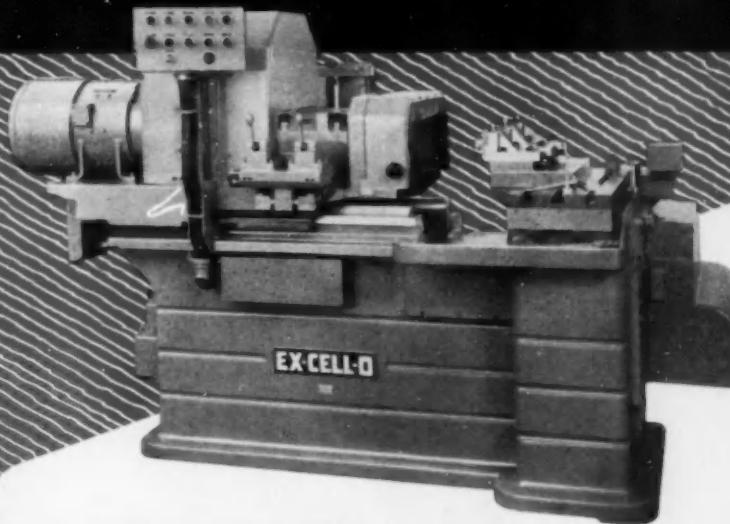
Odd-shaped electrodes you consider "specials" may well be standard items for Mallory . . . can be made quickly with existing tools, in a wide range of single-bend, double-bend and irregular shapes.



For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

NEW EX-CELL-O MACHINE

contours valves by direct cam action (no levers)

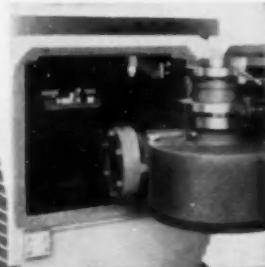
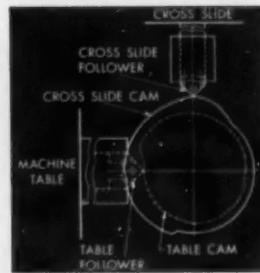


NEW EX-CELL-O CAM BORING MACHINE,
Style 312, equipped with two spindles and
tooling for operations on valve heads.

VALVES ARE CONTOURED, faced, turned, and taper-turned. This drawing shows the two tools used in each station. The paths they follow on the workpiece are indicated in heavy lines.



CONTOURING ACTION: Cams act directly on the slide—**NO LEVERS.** Separate cams for table and for cross slide are both on one shaft, giving exact co-ordination.



CAMS CHANGED IN MINUTES: Cam assembly swings out for quick change of operation. All motors are outside the base.



CHIPS, COOLANT CANNOT ENTER THE BASE. Large chip chute is cast integral with the solid top of the heavy nickel iron base.



55-1

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS
AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

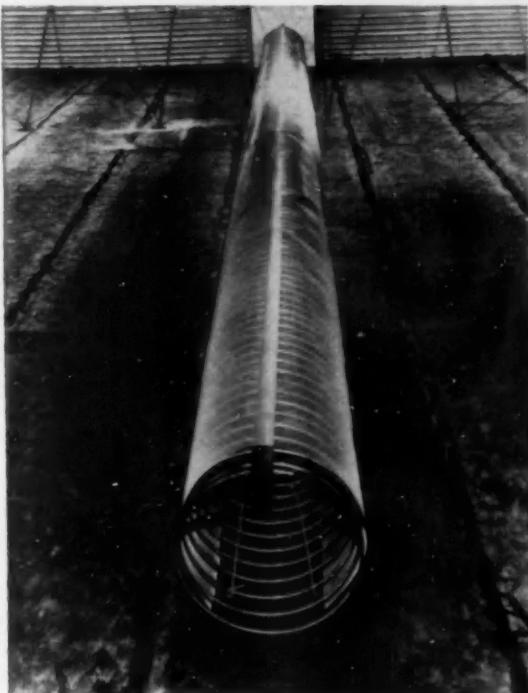
Can you guess what these American

A

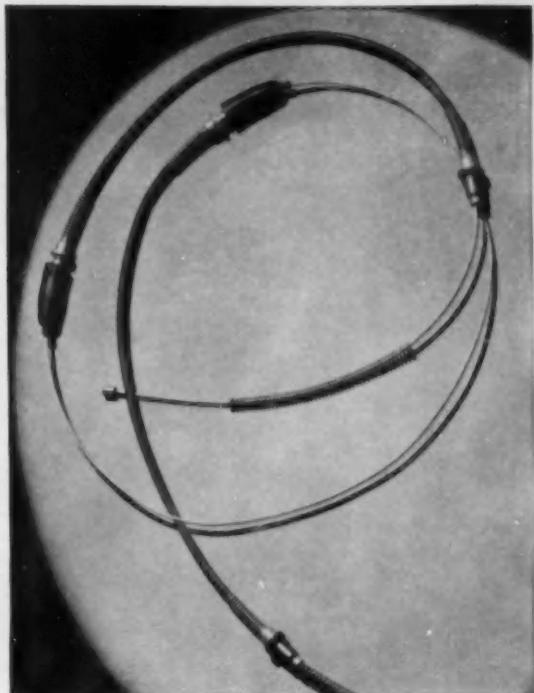


Quality Springs are used for?

[B]



[C]



ANSWERS

[A]

CAR-PROOF. You're looking at the wall of a striking new parking garage just erected in Chicago. American Steel & Wire furnished miles of stainless steel strand that runs continuously from the roof to the ground—where it is stretched tight by means of American Quality Springs. Appearance is breathtaking, and the novel construction prevents cars from rolling off the concrete slabs.

[B]

ONE LUNG GRAIN BIN. When grain is stored, it must be adequately ventilated. American Steel & Wire produced thousands of these enormous steel "springs" that can withstand tremendous radial loads. In fact, they are laid on the floor of the bin, wrapped with AS&W Insect Screen, then covered with tons of wheat. Air can then be pumped through the tube, and the wheat stays dry and in good condition.

[C]

YOU USE IT ALMOST EVERY DAY. It's not a terrifying medical instrument. Rather, this collection of cable, springs, clips and rubber boots is the entire parking brake assembly for a famous automobile. This entire unit was produced by American Steel & Wire.

●Remember, American Steel & Wire can supply completely fabricated wire and spring assemblies in quantity. Get in touch with your AS&W salesman...take advantage of American Steel & Wire quality—and price.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
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UNITED STATES STEEL EXPORT COMPANY, NEW YORK



USS AMERICAN QUALITY SPRINGS

UNITED STATES STEEL



HOW R/M ENGINEERING SETS

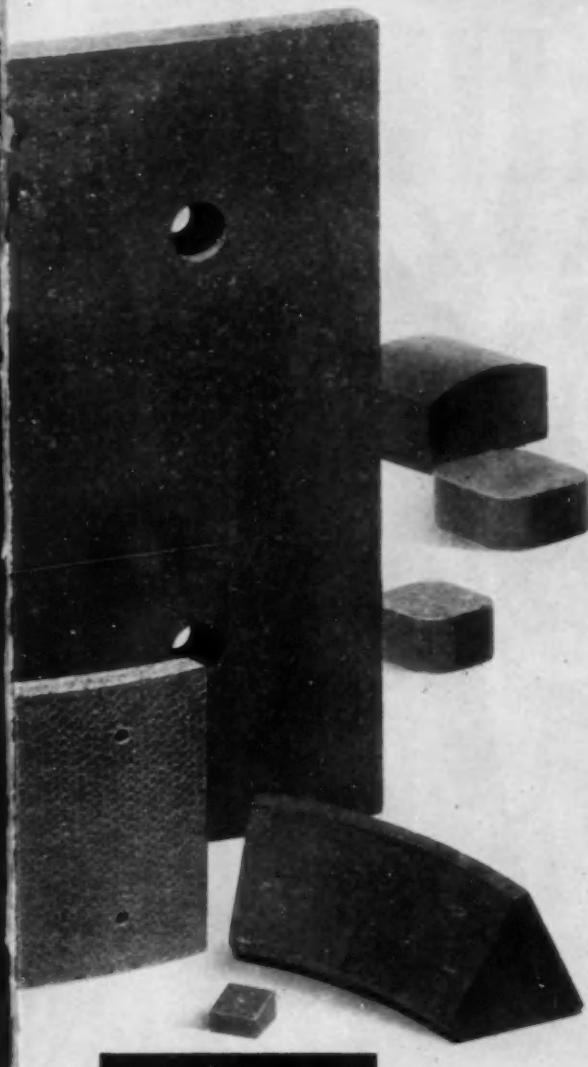


Illustrated here are just a few of the brake blocks R/M manufactures for automotive and industrial use. The full list would include hundreds, differing not only in size and shape but in performance characteristics as well.

**THE RECORD OF "FIRSTS" IN
FRICTION MATERIAL DEVELOPMENT
SHOWS WHY R/M IS
FIRST IN FRICTION**

FIRST Woven Brake Lining • FIRST Asbestos Brake Lining • FIRST Ground Wearing Surface • FIRST Zinc Alloy Wire Brake Lining • FIRST Pre-Treated Yarns • FIRST Extruded Pulp Brake Lining • FIRST Flexible Pulp Brake Lining in Rolls • FIRST Dry Process Brake Lining • FIRST Semi-Metallic Brake Lining • FIRST Bonded-to-Metal Brake Lining • FIRST Woven Clutch Facings • FIRST Molded Asbestos Clutch Facings for Clutches Operating in Oil • FIRST Endless Woven Clutch Facings • FIRST Pre-Treated Clutch Facings • FIRST Bonded-to-Metal Clutch Facings

THE PACE IN FRICTION MATERIAL DEVELOPMENT



THE TRADE-MARK
THAT SPELLS
PROGRESS IN
FRICTION MATERIAL
DEVELOPMENT

BRAKE BLOCKS

Ever seen a brake block 3 feet long—and 5 inches thick? R/M makes this giant with the same skill and precision used to turn out a friction part for ordnance that's smaller than a pencil eraser.

Whatever your requirements for buses, trucks or heavy industrials, there is no brake block size or type R/M can't produce to help you meet them exactly.

Raybestos-Manhattan has been the world's largest maker of friction materials for over 50 years. In this time, R/M has acquired a fund of knowledge and experience second to none in the industry.

For example, just since 1947, four bus fleets in continuous field testing of R/M brake block materials have covered a total of 3½ million miles. And on some of the world's largest and most versatile dynamometers, R/M engineers are exploring the fade, recovery and other characteristics of different brake blocks and combinations in a continuing search for friction materials of greater output and greater durability, and at a lower price.

Type of drum the brake block works against, temperature range the block must work in, and general friction range required are all factors that affect brake block performance. R/M's knowledge of how and why have already enabled us to solve friction problems you may be facing now.

Only R/M Works with All Friction Materials

To meet your specific design and operating requirements, R/M offers the widest range of friction materials in the industry. Unlike most other manufacturers, R/M works with *all kinds* of friction materials. That's why, when you consult an R/M Engineer, you can be sure of completely unbiased, impartial advice on which materials or combinations of materials are best for your purpose.

Whether your product requirements are for brake blocks, brake linings, clutch facings, or any other friction part, it will pay you to talk to Raybestos-Manhattan now. All of the facilities of R/M's seven great plants, with their research and testing laboratories, and all of R/M's experience, are as near as your telephone.

Write for your free copy of R/M Bulletin No. 500. Its 44 pages are loaded with practical design and engineering data on all R/M friction materials.



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EQUIPMENT SALES DIVISION: 6010 Northwest Highway, Chicago 31, Ill. • Detroit 2 • Cleveland 14 • Los Angeles 58
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Canadian Raybestos Co. Ltd., Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Brake Linings • Brake Blocks • Clutch Facings • Fan Belts • Radiator Hose • Industrial Rubber, Engineered Plastic, & Sintered Metal Products • Rubber Covered Equipment • Asbestos Textiles • Packings • Abrasive & Diamond Wheels • Bowling Balls

PRATT & WHITNEY "KELLERING" . . .

DOES BIG JOBS BETTER!

BIG AND COMPLICATED . . .

THE PART:

a 20 ft. diameter ring section from a water turbine.

REQUIRED:

accurate machining of 16 blade recesses following the contour of inner wall.

COMPLETED:

simply and economically by lowering the work over a BG-22 Keller Machine. A single 3-dimensional model served for all 16 recesses.

(Photo Courtesy Markham & Company Ltd., Chesterfield, England)



P & W KELLER MACHINES . . .

- **MAKE HARD JOBS EASY . . .** handle shapes and curves that cannot be machined economically by any other method.
- **ARE DESIGNED, BUILT SPECIFICALLY for TRACER-CONTROLLED MILLING . . .** not just "adapted". They handle a wide variety of jobs without major adaptation by expensive attachments.
- **ARE RUGGED, RIGID, EFFICIENT, DEPENDABLE . . .** stay on the job year after year without frequent or expensive maintenance.

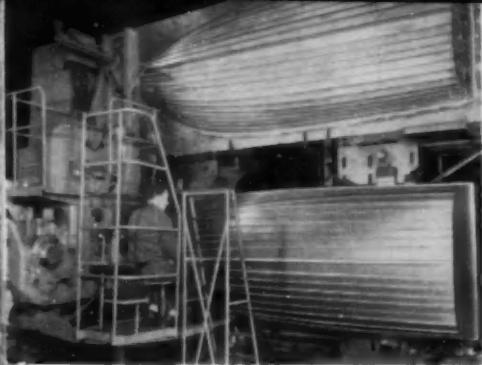
- **FEATURE BUILT-IN ELECTRIC TRACER CONTROL . . .** which provides a quick change from 2-dimensional profiling to 3-dimensional milling . . . duplicates exactly without need for compensating master.

You can't guess about the right machine . . . or other equipment for **your** job requirements. To achieve maximum productive efficiency, every machine tool you buy must be carefully selected and expertly application engineered to meet **your** specific needs exactly!



SEE US AT BOOTH 1219



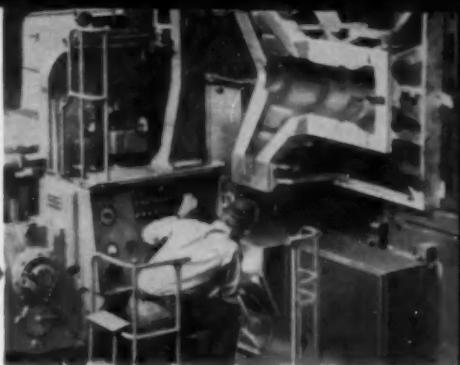


FIBERGLASS MOLDS . . . Kellering the male half of a mold to be used in producing sixteen-foot fiberglass motorboat hulls. Both male and female molds were duplicated from wood models.

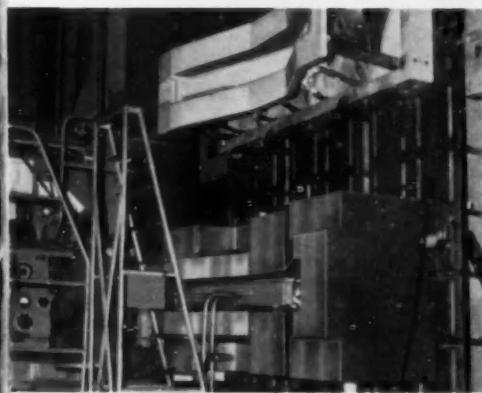
(Photo Courtesy
R. H. Freitag Co., Akron, Ohio)

LARGE AIRCRAFT DIE . . . for making aluminum forgings. Three-dimensional milling from a plaster model. Work size capacity of this BG-22 Keller Machine is 10' x 5'.

(Photo Courtesy
Wyman-Gordon Co., Worcester, Mass.)



AUTOMATIC TRACER-CONTROLLED MILLING of COMPLEX, IRREGULAR SHAPES

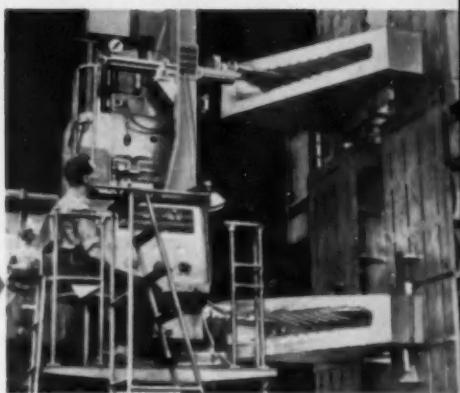


FORGING DIE . . . for big, magnesium aircraft parts is machined on a P&W BG-22 Keller Machine. Exact form of the plastic model is duplicated quickly, economically.

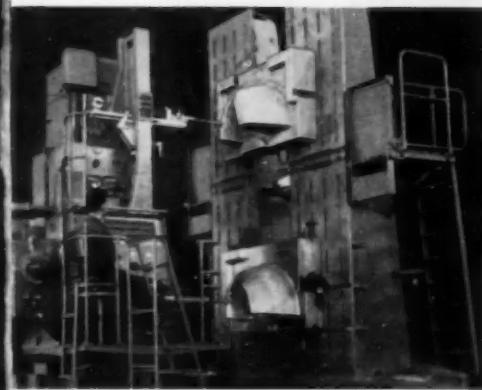
(Photo Courtesy
Wyman-Gordon Co., Worcester, Mass.)

DEEP, NARROW INTERNAL SECTIONS . . . make this aircraft forging die extremely difficult to produce. Keller electric tracer control allows accurate duplication of this deep cavity.

(Photo Courtesy
Canadair Ltd., Montreal, Quebec, Canada)



HERE'S THE BG-22 ON THE JOB

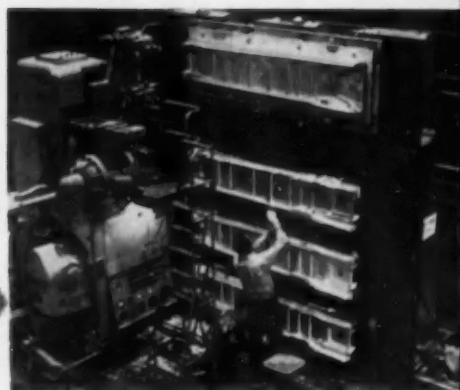


BIG PLASTIC MOLD . . . for manufacturing the "radome" in the nose of a military aircraft. Although this machine has capacity of 12' x 6', small or large jobs are handled with equal ease.

(Photo Courtesy
Canadair Ltd., Montreal, Quebec, Canada)

PRODUCTION CONTOUR MILLING . . . of large aluminum alloy forgings three at a time on a BG-22 3-Spindle Machine. Parts are main wing beams for jet fighter planes.

(Photo Courtesy
Chance Vought Aircraft, Inc., Dallas, Texas)



P&W FACTORY-DIRECT SERVICE

To provide expert application engineering service, all Pratt & Whitney products are made available to you only through our own Factory-Direct Representatives. Each a specialist, these men — working from Branch offices conveniently located throughout the country — are fully qualified by training and experience to help solve your tough production problems . . . to help you select equipment exactly right for your specific needs.

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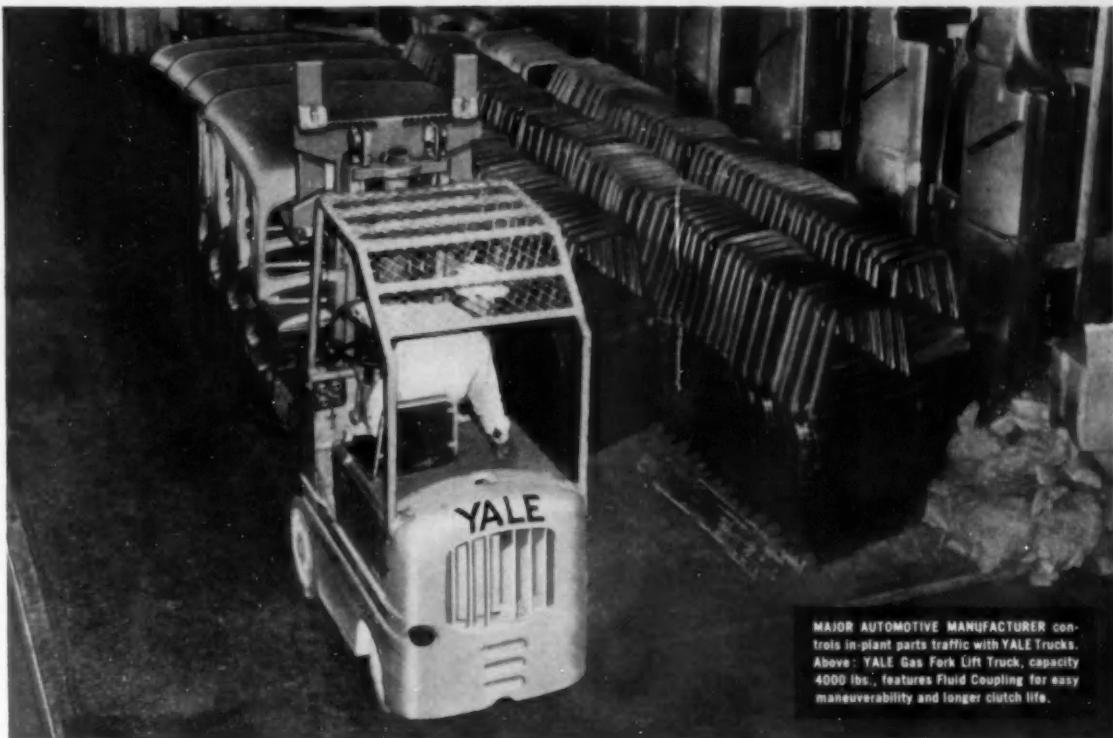
when it comes to AUTOMATION

This eight station multiple spindle dual loading Transfer Type Machine uses an air-hydraulic transfer mechanism. Various drilling and tapping operations are performed on cast iron carburetor throttle bodies at the rate of 450 per hour at 100% efficiency. Parts are located and clamped automatically in previously machined butterfly valve holes at each station. Parts ride free on rails between work stations. New brochure shows why, when it comes to automation . . . it pays to come to . . .



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Special

THE HARTFORD SPECIAL MACHINERY CO. • HARTFORD 12, CONN.



MAJOR AUTOMOTIVE MANUFACTURER controls in-plant parts traffic with YALE Trucks. Above: YALE Gas Fork Lift Truck, capacity 4000 lbs., features Fluid Coupling for easy maneuverability and longer clutch life.

Meet competition on the production line with Yale Trucks

Integrate YALE Trucks into your overall handling system from receiving docks through assembly—and get the extra margin of efficiency that keeps parts rolling to and from storage *on schedule*. Performance records in many applications throughout industry prove that every truck in YALE's complete Gas, Electric and Diesel line works harder and lasts longer—with less downtime, less operator fatigue. For the automotive industries, this means: (1) faster, smoother, safer *day-to-day* handling of loads of every type and size—small parts in bins, bulky sheet metal parts, racked motors and transmissions, tires, other materials; (2) *long-term* dependability with significant savings on maintenance and replacement costs. For full information about the YALE Trucks that are best suited to your operations, send coupon today.

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TRUCKS AND HOISTS

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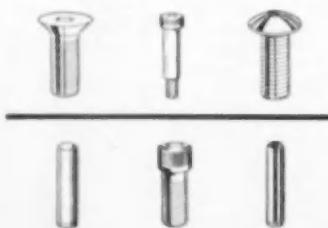
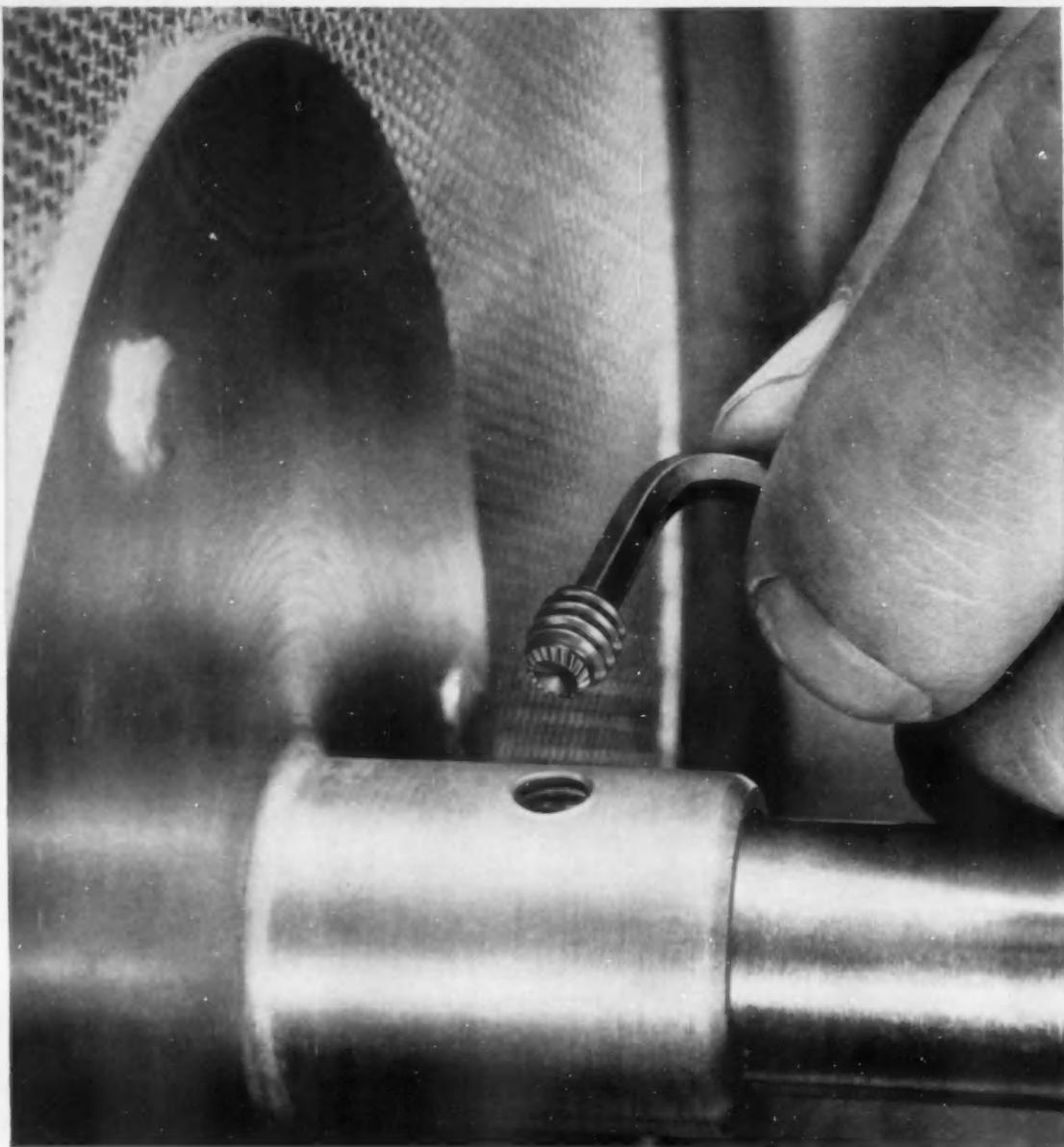
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HOW TO KEEP A SET SCREW TIGHT. Tighten it as tight as possible. Keep it in place by preventing it from starting to work loose. With UNBRAKO Self-Locking Socket Set Screws you can do both. They are designed for the highest recommended tightening torques in the industry—as much as 45% higher than those used for ordinary socket set screws. UNBRAKOS have the unique knurled cup point which prevents them from starting to work loose, even in poorly tapped holes. For the complete UNBRAKO story, see your industrial distributor—or write STANDARD PRESSED STEEL CO., Jenkintown 53, Pa.



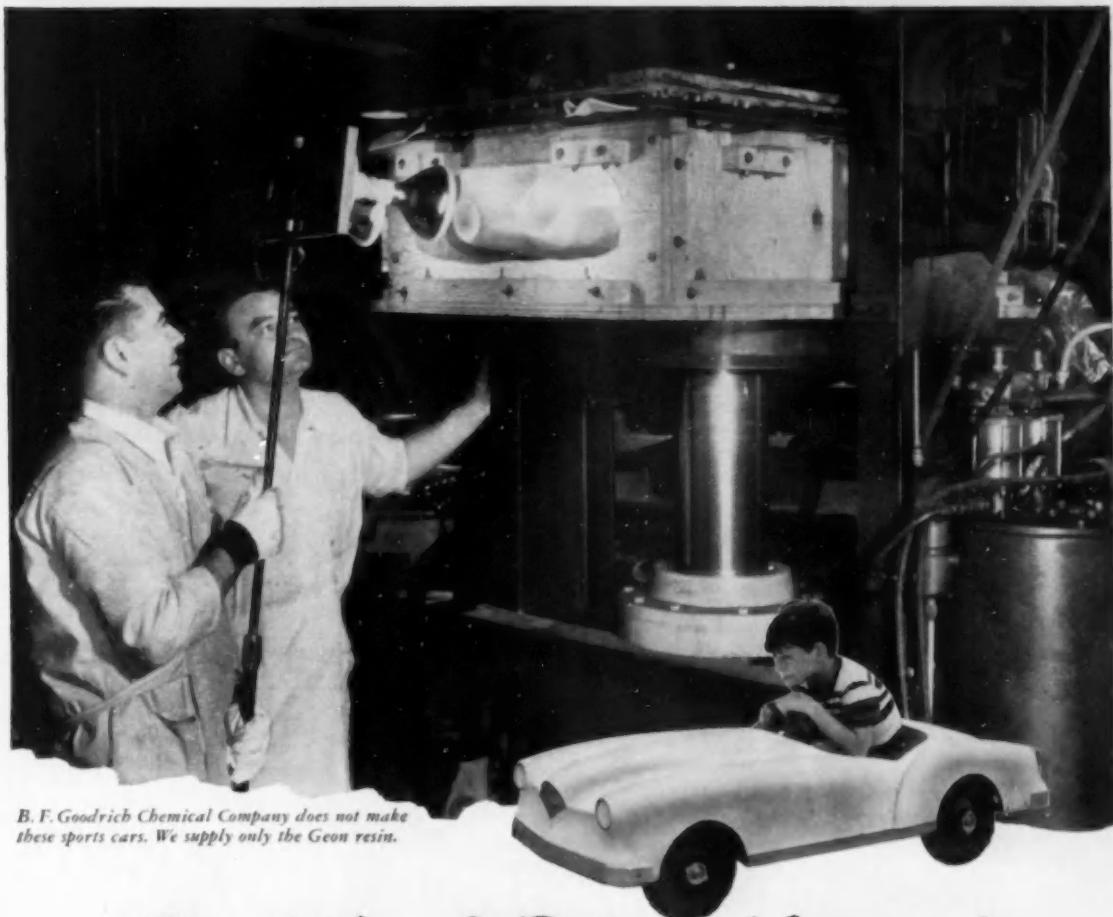
SOCKET SCREW DIVISION



JENKINTOWN, PENNSYLVANIA

Another new development using

B. F. Goodrich Chemical *raw materials*



B. F. Goodrich Chemical Company does not make these sports cars. We supply only the Geon resin.

Rigid Vinyl Rides a Winner!

THESE 5-foot models of a famous sports car—prizes in a recent contest—had to be made on a hurry-up schedule and a hold-it-down budget. Using high impact rigid vinyl made from Geon resin, the fabricator was able to turn the cars out quickly, cheaply, and easily.

Oven-heated sheets pre-cut to size were placed in an inexpensive forming die and deep drawn. The whole cycle, heating included, took less than ten minutes. The fabrication included ingenious vacuum-formed

under-cut sections to match the design of the parent model.

This is typical of the fine detail work which can be formed from versatile Geon without incurring heavy tooling costs. It may suggest an improvement, a new idea, or a way to save money or time in your own operations.

Geon is available in many forms, including materials for colorful flexible upholstery, long-lasting floor coverings, tough insulation for wires, durable coatings, sponges, and many more. For information on Geon ma-

terials and applications, please write Dept. BA-3, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.



GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable.

GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

Bendix Products Division

A good reliable source

FOR AUTOMOTIVE EQUIPMENT

From four wheel brakes to the latest development in power braking, Bendix Products Division has demonstrated its unique ability not only to keep pace but *actually to anticipate* the industry's requirements for the latest and most efficient in automotive components.



BENDIX LINKAGE TYPE POWER STEERING—Because Bendix* Power Steering is of the linkage type, manufacturers find it especially adaptable for production line installation without extensive engineering changes. Manufacturers can now meet the ever-increasing demand for power steering more efficiently and more economically with Bendix Linkage Type Power Steering.

BENDIX LOW PEDAL POWER BRAKE—Specified by more car manufacturers than any other make, Bendix* Low Pedal Power Brake makes possible quick, sure stops by merely pivoting the foot from the go to the stop control. No need to lift the foot and exert leg power to bring the car to a stop. Result—more driving comfort, less fatigue and greater safety.

*REG. U. S. PAT. OFF.

BRAKES • POWER STEERING • POWER BRAKING • CONSTANT VELOCITY UNIVERSAL JOINTS • HYDRAULIC REMOTE CONTROLS

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High Spots of This Issue

★Mergers and Monopoly Myth in the Automobile Industry

Presented here is the first part of a two-section article by an authority on the economic and legal structure of the automobile industry. Its publication is particularly timely in view of the anti-trust investigations currently being agitated. See Page 48.

★Special Hardenable Iron Developed for Tappets

The materials traditionally used for hydraulic valve tappet bodies have left something to be desired in fulfilling requirements for today's high-speed, high-compression engines. Chrysler has come up with a new hardenable alloy type. Page 52.

★New Production Techniques for Tubeless Tires

Currently in universal use on all 1955 passenger cars and on many commercial vehicles, tubeless tire production has brought about innovations in manufacturing methods. Described in this article are techniques now employed by U. S. Rubber Co. Page 56.

★Semi-Production Department Helps to Maintain Jet Output

Two ever-present bugaboos in the manufacture of military aircraft are changes in product design and manufacturing procedures. Analyzed here is the way in which the Ford Aircraft Engine Div. is facing this troublesome problem. See Page 62.

★Torsion Bars Mass-Produced in German Car Plant

The handy Volkswagen is one of the few cars in volume production in Europe to feature all-around torsion bar suspension. The author describes in this on-the-spot account just how the units are made with the methods and the machines used. Page 68.

★46 New Product Items And Other High Spots, Such As:

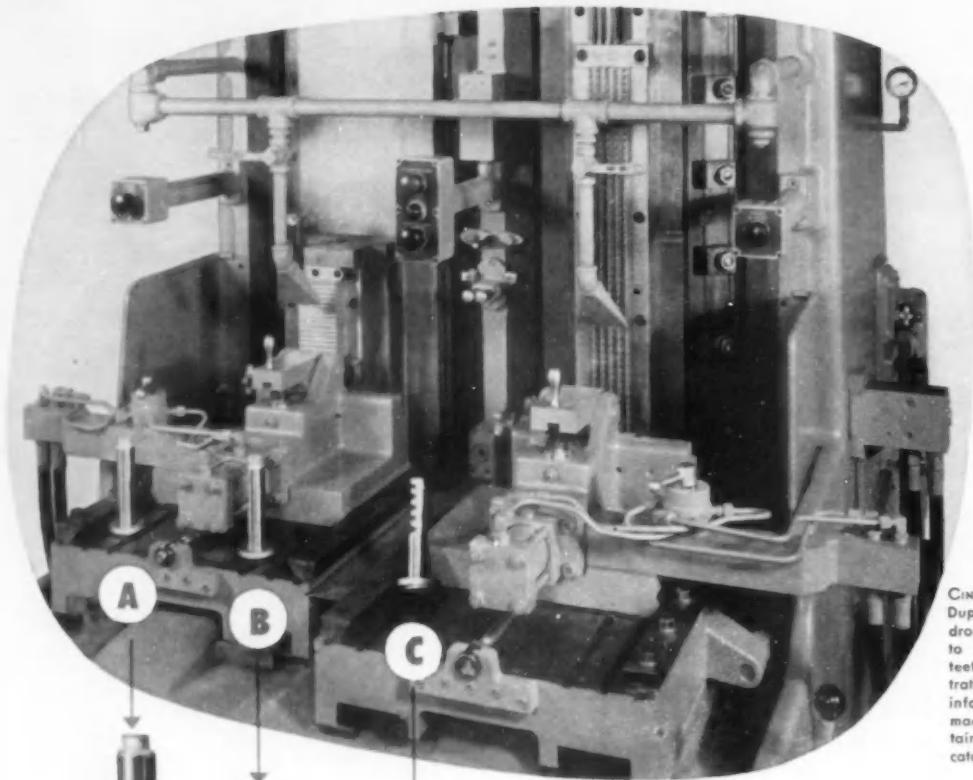
Internal engine parts televised; automatic transmissions prove efficient in Economy Run; design features of new Ausco disk-type wheel brakes; radio controlled trucks increase efficiency; and telescriber system reduces delays in aircraft plant.

Automotive and Aviation News, Page 33

Complete Table of Contents, Page 3

AUTOMOTIVE INDUSTRIES COVERS

PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES
• BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY •
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
ENGINEERING • SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
PRODUCTION • MANAGEMENT



CINCINNATI No. 10-66
Duplex Vertical Hydro-Broach, toolled up
to broach the rack teeth on parts illus-
trated here. Complete
information on these
machines may be ob-
tained by writing for
catalog No. M-1848.

Prior to Hydro-Broaching

Flat Hydro-Broached
in first station

Teeth Hydro-Broached
in second station. Finish of teeth, 40 to 50
micro-inches accuracy
 $\pm .0004"$ on linear
pitch. Production complete, 100 per hour.



CINCINNATI No. 10-66
Duplex Vertical Hydro-
Broach. Catalog No.
M-1848.



These Parts Get a Low Cost Set of Teeth on CINCINNATI VERTICAL HYDRO-BROACH MACHINE

Surface broaching, as a machining operation, cut its teeth years ago. Today it is being applied to an ever-increasing variety of parts and operations, including the machining of rack teeth. Cincinnati Application Engineers know how to broach a low-cost set of teeth on short parts or yard-long parts. The most recent example of their work is illustrated here: a CINCINNATI No. 10-66 Duplex Vertical, with complete tooling, ready to broach the teeth on piston rod racks at the lowest cost. ¶The parts arrive completely turned and the stem rough ground. Rack teeth are broached in two progressive operations; a flat which forms the top of the teeth is broached in the left-hand station, and the rack teeth are broached in the right-hand station. Production, 100 per hour complete. ¶CINCINNATI Hydro-Broach Machines and Cincinnati Application Engineers form a team that just can't be beat in visualizing and building complete production packages for your work. These men are ready to help you solve your production problems. Why not write now, enclosing blueprints and complete details.

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING
MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES
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News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 112, No. 9

May 1, 1955

Ford Financial Report Release Not Likely Until Second Half

Further information about the release of Ford Motor Co.'s first financial statement indicates the report may not be published until sometime during the second half of this year. The financial report probably will be made preliminary to the announcement of public sale of Ford stock by the Ford Foundation. Whether the report will cover only the company's current year's operations or contain a run-down of profits for more than one year is not known yet.

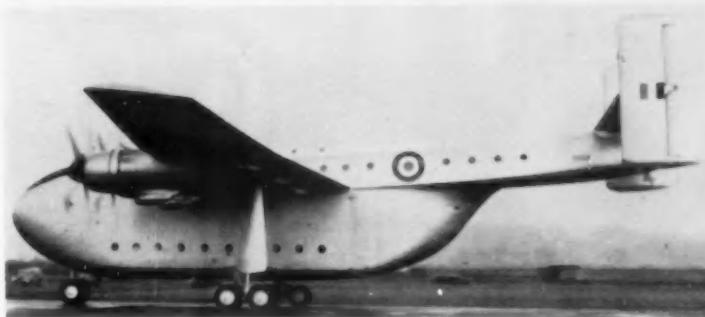
However, Ernest R. Breech, chairman of the board, recently declared that the hitherto-unpublished details of Ford's operations "will show the company to be in sound financial condition, as contrasted with the first half of 1946." In that postwar period the company reportedly was losing about \$10 million a month.

Since 1946, Ford's policies have been the same as they would have been had the company been held accountable by stockholders, as far as profits, dividends and financing of new plants and facilities are concerned, Mr. Breech said.

Kansas City B-O-P Plant To Halt Jet Production

Defense production at another automobile plant will come to a standstill this year. The General Motors B-O-P assembly plant in Kansas City, Mo., will suspend jet aircraft operations this summer, and several hundred workers will be transferred to automotive production at the plant.

One of several "dual-purpose" plants operated by GM, the Kansas City facility has been producing F-84F Thunderstreak jet fighter bombers for the Air Force and automobiles under the same roof. During World War II, North American Aviation built warplanes at the plant.



GIANT BRITISH AIR FREIGHTER IN PRODUCTION

First production model of the Beverly Superfreighter has now been flight-tested by Blackburn & General Aircraft, Ltd. The plane weighs 135,000 lb and has a wing span of 162 ft, length of 99 ft, and maximum payload of 22 tons with 7500 cu ft of cargo capacity. Power is from four 2850-hp Bristol Centaurus engines.

Brief Tire Shortage Hit GM During Rubber Strike

For several days last month (April), General Motors was delivering automobiles to its dealers without a spare tire as a result of the seven-day strike at U. S. Rubber Co. It was the second time within eight months that a car manufacturer had to drop the fifth tire temporarily.

Last August, Ford shipped cars for awhile without spare tires because of a strike at Firestone. Settlement of the U. S. Rubber strike ended a threat to current record automobile production.

Citroen and Panhard Form A Cooperative Arrangement

Citroen, second largest automobile manufacturer in France, and Panhard, oldest and fifth largest French car producer, have announced a cooperative agreement. In some aspects, the agreement seems tantamount to a merger of the two concerns.

Citroen acquired a substantial, although undisclosed, interest in Panhard. In addition to working partly

for Citroen in the future, Panhard will continue production of its own models and is expected to undertake expansion with technical and financial aid from Citroen.

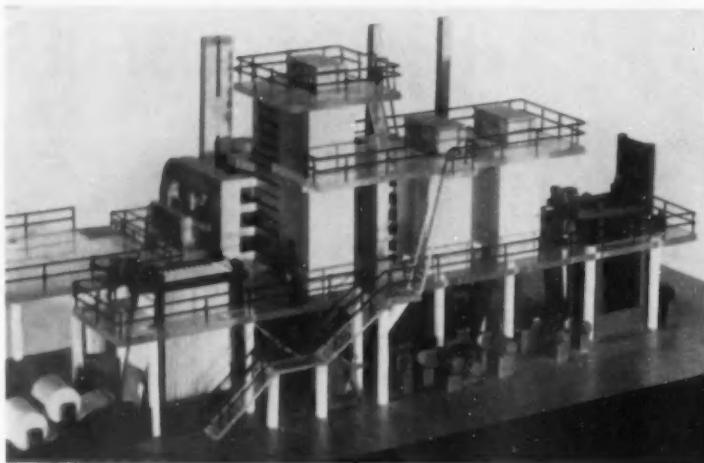
Hudson Making Progress On Military Activities

Announcement by American Motors Corporation, that the Hudson Special Products Div. has received a contract for development of a new retractable wheel utility trailer for the Air Force indicates the division is moving gradually into higher bracket military work. The latest award marks another step in the division's efforts to obtain "prime" contracts.

Under the latest contract with the Air Force, the Special Products Div. will engineer, design and develop a series of six versions of the utility trailer. Value of the new contract was not disclosed.

One of the division's major projects at present is the "Mighty Mite" military vehicle. The division has already delivered a prototype model of the vehicle to the Marine Corps.

News of the AUTOMOTIVE



FIVE-STORY ELECTRONIC TIRE CORD UNIT

Shown here is a model of a new electronically controlled safety tension gum-dipping unit. Now being operated by Firestone Tire & Rubber Co. at Gastonia, N. C., it immerses tire fabric in a gum-dip solution. The fabric is then stretched and heat tempered as it passes through direct gas-fired heating towers and water-cooled tension pull rolls. Fabric produced by this multi-stage unit is made under constant electronic monitoring of the temperature and tension applied at automatically controlled speeds.

Buick Is Confident of Holding Third Place for First Quarter

Buick, which jumped to third place in sales last year, is confident it will retain that position for the first quarter of 1955. According to new car registrations for the first two months, Buick was ahead of fourth-place Plymouth by about 8000 units. Its latest report shows that Buick delivered 209,118 cars in the first 100 days of this year.

Chrysler Tank Arsenal Put On Standby Basis

Efforts to obtain a new defense contract for Chrysler Corp.'s tank arsenal in Center Line, Mich., have thus far been futile (see AI, Feb. 15, p. 34), and the plant will now be put on a standby basis. The announcement that production of T-51 heavy tank retrievers has been completed at the plant came exactly one year after Chrysler placed its two million sq ft tank engine plant in New Orleans on a standby basis.

Both the Center Line and New Orleans plants are owned by the Government, but they have been op-

erated by Chrysler under contracts. The Center Line plant, which contains one million sq ft of tank manufacturing facilities, during the past 13 years built more than 30,000 tanks and tracked vehicles, starting with the General Grant in 1941.

Like the New Orleans unit, the Center Line plant can be reactivated within 48 hours for machining work and could be put into tank and tank engine production in a matter of weeks. A small staff of machine repairmen, plant engineering, office, and plant protection workers will be maintained under the standby program for Army Ordnance.

General Tire Anticipates New Guided Missile Work

An additional \$200 million guided missile contract is being negotiated by General Tire & Rubber Co. The missile production would be carried on at a new plant which the Government would construct in Joplin, Mo., and lease to General, if a proposed five-year contract is signed. At present, the Aerojet Div. of General Tire is producing guided missiles.

Lincoln, Mercury Divorced; New Car Line Possibility

Ford Motor Co. has officially confirmed recurring reports during the past several years that the Lincoln-Mercury Div. would be separated into two autonomous organizations. At the same time, the company announced that it is forming a new Special Products Div.

The latter conceivably might result eventually in the introduction of at least one new car line.

The Continental Div., which will go into production on a new luxury car later this year, is the outgrowth of a Special Products Div. which Ford dissolved last October.

Announcement of the changes in the Ford Motor Co. organization program is another step in the company's plan to provide a specialized management team to coordinate production and sales of each of the company's car lines. The Mercury Div. field sales organization will, temporarily, represent Lincoln and Mercury in the marketing areas of both cars until a Lincoln Div. field sales force is established.

Personnel Appointments

The organizational changes also result in the appointment of two new vice-presidents of Ford Motor Co. They are F. C. Reith, who in 1954 served as managing director of Ford of France, and Ben D. Mills, assistant general manager of the Continental Div.

Reith will also serve as general manager of the Mercury Div., while Mills will hold a similar position with the Lincoln Div. Mills also will continue as assistant general manager of the Continental Div.

Benson Ford, vice-president and former general manager of L-M, becomes group director of the Mercury and Special Products Div. William Clay Ford, general manager of the Continental Div., becomes vice-president and group director of Lincoln and Continental. R. E. Krafve, formerly assistant general manager of L-M, has been named general manager of the revived Special Products Div. under the new setup.

AND AVIATION INDUSTRIES

First Profit Since Merger Reported by S-P for March

First financial benefits of the Studebaker - Packard merger were achieved in March, when the corporation revealed that it earned a profit that month for the first time since the corporation was organized last October. Although not citing any figures, the corporation reported that sales of Packard and Studebaker cars were up more than 70 per cent in the first quarter over the same three months last year.

According to the progress report, Packard production has reached its initial target of 2000 units a week. Current backlog of orders is approximately 20,000. From the beginning of the year until mid-April, the two divisions built a combined total of slightly more than 74,000 cars, compared with about 41,000 in the same period last year.

The first stockholders meeting in Detroit, where the progress report was presented, revealed some other interesting information. For the first time, James J. Nance, president of S-P, officially confirmed reports that the corporation would use three Studebaker plants to assemble both the Studebaker and Packard models.

The three plants — located in Vernon, Calif., New Brunswick, N. J., and Hamilton, Ont. — are scheduled to go into combined operation around October.

Although Mr. Nance indicated that there are no plans at present for basic integration of both cars, the decision to produce both cars at the aforementioned Studebaker plants is another step toward greater interchangeability of parts between the two makes.

New Color Combinations Offered on Chevrolets

Chevrolet has added several more hues to its present line of colors for cars. New colors in the passenger car line include Cashmere Blue, and combinations of India Ivory with Cashmere Blue or Navajo Tan or Dusk Rose. Three colors also are offered on the Corvette—Harvest Gold, Gypsy Rose and Bronze.



HUGE CARGO CARRIER TO CROSS FROZEN WASTES

The LeTourneau Sno-Freighter, said to be the world's largest vehicle on rubber tires, is shown being loaded with pipe for a test run at the manufacturer's proving ground. The 274-ft transporter, specially designed to cross Arctic snows on 24 huge tires mounted on electric wheels, consists of a power-control car and five cargo cars with a load capacity of 25 tons each. Wheel motors are powered by direct current, while control motors use alternating current. Power is supplied from two generator sets mounted in the power control car. Each set consists of a Cummins NVHBI-1200 400-hp Diesel engine, an a-c generator, and a d-c generator.

DePaolo Seen Top Candidate For Shaw Indianapolis Post

There are persistent rumors in the racing fraternity that Peter DePaolo, 1925 Indianapolis winner, has the "inside track" to succeed the late Wilbur Shaw as general manager of the Speedway. Tony Hulman, Jr., owner of the Speedway, is expected to announce the new general manager after this year's race.

All Previous GM Records Fell During First Quarter of 1955

General Motors Corp. has reported that all its previous records in net sales, net income, unit sales, total employment, and average weekly worker earnings were broken during the first quarter of 1955. This information was disclosed by Harlow H. Curtice, GM president, at a press conference held prior to the opening of the GM Motorama in Boston last month.

Net sales of all products for the quarter totaled \$3.101 billion, compared to \$2.410 billion for the first three months of 1954. Net income for the quarter was \$309 million,

against \$189 million in the same period last year.

Total employment in GM plants in the U. S. and Canada at the end of March was 550,000 persons; and the world-wide employment figure was 630,000. Average weekly pay of GM wage earners was a record \$103.79.

Unit sales of passenger cars and trucks for the quarter totaled 1,147,094. Mr. Curtice predicted that GM would produce a record of 1,630,000 cars and trucks by the end of April. He went on to add that total output will be 33 per cent above that of 1954 for the same period with passenger cars alone up 40 per cent.

233 New Car Dealers Join Hudson Family

The various sales incentive programs instituted by American Motors Corp. in the past few months are credited by the company with attracting new car dealers into the organization. Hudson, for example, reports that it has franchised 233 additional dealers since the 1955 line of cars was introduced. Nash added 100 in February alone.

News of the AUTOMOTIVE

ALL CHRYSLER LINES SHOW PERCENTAGE GAINS OVER '54 1955 New Passenger Car Registrations*

Arranged by Makes in Descending Order According to the 1955 Two Months' Totals

MAKE	February		January		February		January		Units		Per Cent of Total	
	1955	1954	1955	1954	1955	1954	1955	1954	1955	1954	1955	1954
Ford	102,649	88,814	91,789	107,572	173,202	21,55	24,38	21,55	24,38	21,55	24,38	21,55
Chevrolet	55,377	77,810	55,377	77,810	77,810	17,623	19,412	17,623	19,412	17,623	19,412	17,623
Buick	51,934	50,568	33,292	102,216	56,771	11,16	8,02	56,771	11,16	56,771	11,16	56,771
Plymouth	46,531	47,364	29,318	33,882	62,650	10,25	9,82	33,882	62,650	10,25	9,82	33,882
Oldsmobile	40,379	39,893	20,808	80,250	34,565	8,76	4,87	80,250	34,565	8,76	4,87	80,250
Pontiac	36,406	36,614	25,292	71,920	49,947	7,86	7,03	71,920	49,947	7,86	7,03	71,920
Mercury	23,223	21,249	23,062	44,456	46,922	4,85	6,61	44,456	46,922	4,85	6,61	44,456
Dodge	19,809	20,651	10,976	40,452	22,559	4,41	3,18	40,452	22,559	4,41	3,18	40,452
Chrysler	11,398	13,347	8,471	24,732	17,504	2,70	2,46	24,732	17,504	2,70	2,46	24,732
Cadillac	10,931	12,530	8,409	23,450	9,628	2,56	1,38	23,450	9,628	2,56	1,38	23,450
De Soto	8,382	8,963	6,046	17,347	13,010	1,89	1,83	17,347	13,010	1,89	1,83	17,347
Studebaker	7,308	6,640	7,046	13,948	14,929	1,52	2,10	13,948	14,929	1,52	2,10	13,948
Nash	4,325	4,845	5,490	8,970	11,264	.98	1,59	8,970	11,264	.98	1,59	8,970
Hudson	2,451	2,494	2,221	4,945	5,162	.54	.73	4,945	5,162	.54	.73	4,945
Parkard	3,100	1,690	3,718	4,789	7,812	.52	1,10	4,789	7,812	.52	1,10	4,789
Lincoln	1,995	2,179	2,750	4,172	5,419	.46	.76	4,172	5,419	.46	.76	4,172
Willys	733	727	1,325	1,461	2,729	.18	.38	1,461	2,729	.18	.38	1,461
Kaiser	170	201	489	371	948	.04	.13	371	948	.04	.13	371
Misc. Domestic	78	75	175	102	460	.01	.06	102	460	.01	.06	102
Foreign	2,563	2,590	1,546	5,105	3,026	.56	.43	5,105	3,026	.56	.43	5,105
Total All Makes	476,584	440,024	368,592	916,278	710,380	100.00	100.00	916,278	710,380	100.00	100.00	916,278

* Based on data from R. L. Polk & Co.

GAW Negotiations Might Last Into Summer Months

It certainly will be several weeks, and it might be mid-summer before current contract negotiations between UAW-CIO and individual automobile companies will result in new agreements. This conjecture seems reasonable, in spite of the fact that current contracts officially terminate starting May 29 with GM and two days later for Ford. There is plenty of precedent for extending current contracts by mutual agreement. Introduction of the guaranteed annual wage demand into negotiations this year has taken the talks out of the normal area of hourly rates and similar conventional matters.

Many Questions to Be Weighed

Since many entirely new and complex problems must be resolved, a new agreement should take a long period of deliberation and compromise. Talks have been under way nearly a month now, and so far have been fairly amicable.

During the first two weeks, little was accomplished other than the presentation of its case by the union and the interjection of some questions by management representatives. The

pace will step up as contract termination time approaches, but it is highly doubtful that the whole complex issue can be settled by the end of this month.

Bargaining Proceeds Earnestly

Opinion in Detroit at the moment is that chances are more likely for a peaceful settlement than for a walkout. On the other hand, there seems little doubt that the union would call a strike, if negotiations should break down.

Both sides apparently have agreed at this stage not to fight the battle in the press, but rather to work it out across the bargaining table. General Motors, however, has run full-page newspaper ads in all principal plant cities listing accomplishments during the life of the expiring five-year agreement to indicate that it again would very much like to have a pact of similar duration.

The union, however, has insisted that it will write a new contract for no longer than two years. This point, however, remains open to compromise, particularly as a possible bargaining concession.

Ford Opens Other New Plant: Mahwah Unit Ready in July

Ford Div. has revealed further details about its new assembly plant in Louisville, Ky.—the second the division has opened in the past several months. Five times larger than the old plant in that area, the new facility, occupying more than 1.5 million sq ft of space, started production April 18.

A third new assembly plant, located in Mahwah, N. J., is expected to go into production in July. The San Jose, Calif., plant, first new unit completed this year, went into operation on Feb. 28.

The three new plants are part of the company's \$1.7 billion expansion program launched after the war. The Louisville plant will increase Ford's output from an average of 314 cars and trucks to approximately 440 units in a single eight-hour shift.

One of the features of the plant is a manufacturing setup which permits building 15 of the 17 Ford body types. The old plant could assemble only two- and four-door bodies.

Third largest in Ford Div.'s network of 16 assembly plants, the Louisville operation contains approximately seven miles of conveyor systems. It has two separate assembly systems—one apiece for cars and trucks—and each has its own auxiliary operations, such as wheel painting, tire mounting, engine preparation, etc. There are automatic conveyor transfers through the plant and automatic paint spraying units for bodies and parts.

New Headlamp Approved By 39 States and D.C.

Sale of the new improved sealed-beam headlamp will be legal in 39 states and the District of Columbia after July 4. All these states have approved the new lamp, either through legislative action or issuance of certificates which authorize installation by manufacturers. Legislation is pending at present in five other states, and is expected to be introduced in two others — Florida and Alabama.

AND AVIATION INDUSTRIES



X-RAY FLAW DETECTOR

Pratt & Whitney is currently using this huge x-ray machine to detect such flaws as cracks, shrinkage, and foreign matter in castings and weldments. Installed in a lead-enclosed room, the machine uses 70,000 to 250,000 volts, depending on the thickness and density of the material.

Overall Plymouth Expansion To Cost About \$100 Million

Plymouth Div. of Chrysler Corp. has launched an expansion program aimed at a major increase in production above its current level. Speaking at a press conference in New York City last month, William J. Bird, Plymouth vice-president in charge of sales, summarized various phases of the program which have been reported in preceding issues of AUTOMOTIVE INDUSTRIES.

The additional manufacturing capacity will come from a new engine plant in Detroit, scheduled to be in operation next autumn; from the expansion of body-building facilities at the Mack plant of the Automotive Body Div.; from increased facilities for building automobile transmissions; by rearranging production facilities in existing assembly plants at Detroit, Los Angeles, and Evansville, Ind.; and a new administration building in Detroit. When the expansion is completed, it will represent an investment of approximately \$100 million, according to Mr. Bird.

Allis-Chalmers Manufacturing Co. has announced a new HD-16 crawler tractor available with torque converter drive, standard transmission, and a new six-cylinder Diesel engine . . . Caterpillar Tractor Co. has unveiled a new Cat D9 230-drawbar horsepower crawler tractor with turbocharged six-cylinder Diesel engine.

Cummins Engine Co., Inc., is increasing production of its light-weight Diesel engines by another 17 per cent for the second time in two months.

Perfection Stove Co. has changed its name to Perfection Industries, Inc.

Twin Coach Co. has completed an agreement to purchase all the outstanding stock of Davey Compressor Co. . . . Cleveland Automatic Machine Co. reportedly has signed a contract to purchase J. H. Day Co., Inc., food processing machinery manufacturer.

Ryan Aeronautical Co. has disclosed that its Firebee jet target drone also has potential tactical applications and could be used as a guided missile or for reconnaissance.

ElectroData Corp. has opened new offices at 604 Davis St., Evanston, Ill., and 777 14th St., N.W., Washington, D.C. . . . Automotive Div. of Clark Equipment Co. has established a new field office at 403 S. Peoria, Tulsa, Okla.

Bellanca Aircraft Corp. has offered to buy the assets of Pressed Metals of America, Inc. The former recently arranged to buy N. O. Nelson Co., St. Louis, Mo., plumbing supply concern, and its subsidiary, Joplin Supply Co., Joplin, Mo.

A TABLOID

Bell Aircraft Corp. has placed in operation a new IBM Magnetic Drum Processing Machine to aid in determining flight characteristics of supersonic aircraft and guided missiles. The company has also formed a new subsidiary—Bell Exploration & Development Corp.—and has disclosed a new automatic aircraft landing system.

Behr-Manning Div. of Norton Co. is offering a new motion picture for showings to interested groups entitled "Coated Abrasives Speed Metalworking Production."

Bostrom Manufacturing Co. has introduced a new type of truck seat with a torsional rubber spring suspension system.

Climax Molybdenum Co. has reorganized its Sales Dept. into three new domestic divisions—direct sales, metallurgical market development, and chemical market development.

Goodyear Tire & Rubber Co. is producing a new "Blue Streak" racing-type tire.

TelAutograph Corp. acquired Walsco Electronics Corp. and its affiliate, Walter L. Schott Co. . . . Textron American, Inc., has purchased Ryan Industries, Inc.

McGill Manufacturing Co., Inc., is celebrating its 50th anniversary this year.

Westinghouse Electric Corp. has completed the first phase of a multi-million dollar modernization program at its Springfield, Mass., plant . . . Producto Machine Co. is nearing the end of a big expansion and modernization program.

(Turn to page 102, please)

News of the AUTOMOTIVE



View of new International Nickel pilot plating laboratory.



TWO GERMAN MINIATURE AUTOMOBILES

Depicted above are the chassis of two small German cars with exterior views inset. In the top illustration is shown the Brutsch three-wheeler, which is powered by an 11-hp Fitchel & Soehs engine with a displacement of 12.2 cu in. Weighing only 530 lb. the car is 130 in. long, 55 in. wide, and 44 in. high. Below it is pictured the two-door Goggomobil coupe with an engine of 15.1 cu in. displacement.

Plating Research Performed In Production-Type Machine

International Nickel Co. previewed its versatile 13-stage automatic pilot plating plant at Bayonne, N. J., last month. New coatings and processes can be tested on a large scale.

Tanks are mounted on skids for easy arrangement by fork truck. Automatic or manual control allows the transferring and conveying mechanism to hold work at any station from five seconds to several hours or days.

Single or double lines handle work pieces up to three ft in cross section. A central panel board allows time, current and voltage to be observed and controlled.

Other features include: an 18-station manual plating line; a bench-scale laboratory; polishing and buffing room; equipment for salt spray testing, and a controlled humidity storage room.

GE Finds Silicone Cuts Wear on Roads

Silicone chemicals may play an important part in helping to prolong the life of highways. According to General Electric Co., tests conducted on highway pavement and bridge structures on the N. Y. State Thruway showed that concrete treated with SC-50 silicone chemicals resisted deterioration twice as long as untreated sections.

Both the treated and untreated areas were subjected to severe, accelerated freezing and thawing tests. It was found that, although silicone prevents water from soaking into the concrete, it did not make the surface slippery.

Dodge Truck Price Boosts Average Approximately 3½%

Prices announced by Dodge for its 1955 line of trucks indicate an average increase of approximately 3½ per cent over 1954 models. According to the company, prices on certain models remain the same, while some models, particularly the heavier units, have been reduced.

AND AVIATION INDUSTRIES

Excise Taxes Are Reduced On Canadian Automobiles

Canadian automobile manufacturers received good news recently, when the government announced a reduction in the excise tax on automobiles from 15 to 10 per cent. The reduction will mean savings of \$75 a car for purchasers of lower-priced cars.

At the same time, immediate elimination of the 10 per cent excise tax on tires and tubes for both passenger cars and trucks was announced. The tax reductions were announced in the Canadian budget for the fiscal year 1955-56, which began on April 1.

Kaiser Automobile Output For Argentine Market Starts

Willys Motors has halted production of Willys cars and is starting production of 1000 Kaiser units, the first to be produced since last July. The Kaisers, however, are not for the U. S. market, but will fill an initial order of 1000 cars from Industries Kaiser Argentina, a new Kaiser subsidiary in South America.

Production will not call for any output of stampings, however, since bodies completed last year and stored at Willow Run will be used. The cars will be shipped in completed form rather than knocked-down.

The car order is expected to be completed by July, after which Willys will decide whether or not to resume production of the Willys line. Commitments to suppliers for May and June schedules have been deferred to July and August, indicating that the company will resume production of the Willys passenger car. Output has been running at a little more than 300 units a week.

A \$25 million plant at Cordoba, Argentina, is under construction for Industries Kaiser, and will be completed next year. Willys commercial vehicles will be produced utilizing about 50 per cent U. S. components. In the meantime, Willys will continue to supply the Argentina market through its export operation. Passenger car output is scheduled to start in 1959.

It is considered highly unlikely that production of Kaisers for the

1955 RETAIL CAR SALES BY PRICE GROUPS*

Number of Cars

Price Group	February		1954		1955		Two Months	
	Units [†]	% of Total						
Under \$2,000	259,080	54.66	276,438	56.82	479,767	52.65	420,162	50.41
\$2,001 to \$2,500	145,286	30.06	97,367	26.46	287,908	31.59	187,731	20.54
\$2,501 to \$3,500	55,428	11.70	34,000	9.24	113,408	12.45	67,383	7.82
Over \$3,500	14,123	2.88	20,168	5.48	30,138	3.31	32,032	4.04
Total	473,917	100.00	367,979	100.00	911,287	100.00	707,278	100.00

Dollar Volume of Sales

Price Group	February		1954		1955		Two Months	
	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total
Under \$2,000	\$462,450,000	47.06	\$394,201,411	50.29	\$812,192,304	44.83	\$765,320,137	51.16
\$2,001 to \$2,500	330,962,944	32.38	221,999,968	28.30	671,743	33.06	427,280,465	28.56
\$2,501 to \$3,500	157,438,480	15.04	90,555,649	11.58	322,865,788	18.91	161,962,812	12.17
Over \$3,500	57,827,154	5.32	77,000,227	9.09	123,404,519	8.08	120,600,728	8.97
Total	\$1,046,844,000	100.00	\$784,382,282	100.00	\$2,029,894,354	100.00	\$1,495,179,140	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four-door sedan or equivalent model. Does not include transportation charges or extra equipment.

†—New registrations of American made cars only. Does not include imported foreign cars.

U. S. market will be resumed, and there is some uncertainty about the future of the Willys passenger car. Willys has indicated it is going to concentrate its efforts on its commercial line, rather than attempt to be a serious contender in the passenger car field.

Willys also plans to integrate into its own operations production of components formerly bought from outside firms. This includes establish-

ing a Custom Body Building department, which eventually will produce special bodies for personnel carriers, ambulances, and other vehicles. Other projects under consideration for Willys manufacture are windshield frames, seat framework, and radiator grilles.

Continued on Page 100

FORD IN LEAD AS TOTAL TWO MONTHS' SALES TRAIL 1954 1955 New Truck Registrations*

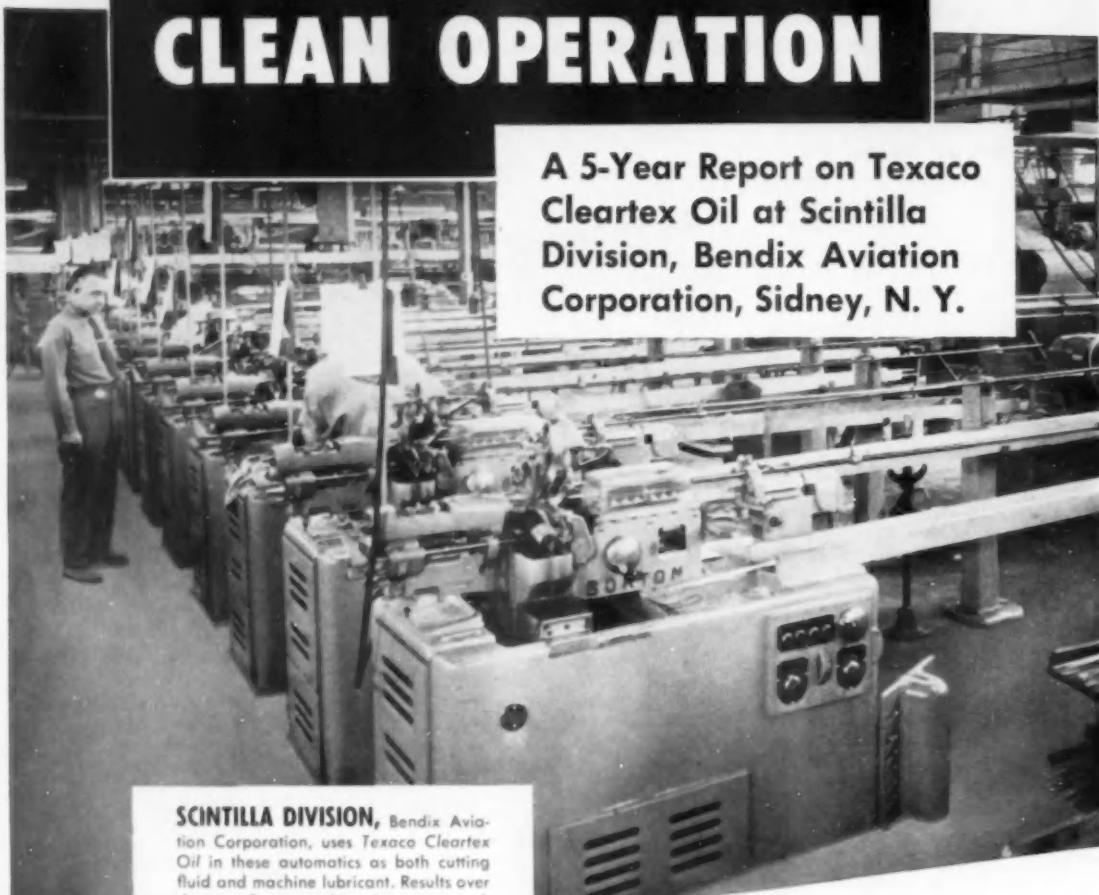
Arranged by Makes in Descending Order According to the 1955 Two Months' Totals

TWO MONTHS

MAKE	February	January	February	1955	1954	1955	1954
	1955	1955	1954	1955	1954	1955	1954
Ford	19,401	18,782	19,956	30,175	30,761	32,23	31,99
Chevrolet	16,496	19,437	20,223	30,624	42,637	30,23	34,59
International	8,857	8,906	9,967	16,251	12,679	12,88	9,94
Dodge	4,602	8,287	4,608	8,083	8,748	8,41	8,02
G. M. C.	3,886	8,161	9,571	9,041	10,784	7,61	8,06
Willys Truck	1,222	1,187	423	945	945	2,04	.70
Willys	916	1,023	961	1,942	1,612	1,64	1,40
Studebaker	772	750	608	1,622	1,673	1,29	1,38
Willys Jeep	687	642	661	1,296	1,231	1,10	1,01
Mack	530	541	388	1,071	793	.90	.66
Diamond T	238	221	197	467	402	.38	.33
Dixie	186	247	169	433	373	.37	.31
Roe	129	213	191	300	372	.28	.31
Brockway	96	87	98	163	107	.15	.18
Kenworth	96	91	38	147	68	.12	.07
Peterbilt	17	23	31	40	58	.03	.06
F. W. D.	16	19	33	38	66	.03	.06
Federal	3	3	32	9	66	.01	.05
Misc. Domestic	54	49	58	97	127	.08	.10
Foreign	71	46	10	118	33	.10	.03
Total—All Makes	98,242	62,231	60,848	118,436	121,842	108,90	106,90

*—Based on data from R. L. Polk & Co.

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Men in the News



E. W. Bliss Co.,
Hastings Div.—Harry
T. Burke has been ap-
pointed chief engineer.

Seneca Falls Machine Co.—Joseph Sawitzke was made manufacturing engineer.

Turner Mfg. Co.—Turner A. Duncan was elected president and chairman of the Executive Committee.

U. S. Broach Co.—Larry Darnell has been made sales manager.

Babcock & Wilcox Co., Boiler Div.—L. S. Wilcoxson has been appointed vice-president in charge.

Chrysler Corp., Defense Operations Div.—David L. Sutter has been appointed director of forward planning, and Jeremiah M. Sullivan has been named coordinator of organization, management and executive development, and industrial education.

American Motors Corp.—Edward J. Cushman has been appointed director of industrial relations.

Westinghouse Electric Corp., Industrial Products Div.—Arthur G. Tichenor has been named manager of manufacturing.

Chevrolet Motor Div., General Motors Corp.—Fred R. Fraser has been named divisional comptroller.

Dodge Div., Chrysler Corp.—Lee F. Desmond was promoted to assistant to the president; Byron J. Nichols, general sales manager in charge of field operations; and William Knuff, director of forward planning.

Eaton Mfg. Co.—E. W. Liptak was elected assistant controller; Andrew C. Paterson, assistant secretary; and H. S. Ide, Jr., secretary-treasurer.

Cadillac Motor Car Div., General Motors Corp.—Harold G. Warner has been appointed assistant works manager.

Republic Steel Corp., Pressed Steel Div.—Samuel C. McDowell has been made division manager; Theodore G. Humphrey, container sales manager; and Frank F. Malcher, pressed steel sales manager.



Seneca Falls Machine Co.—Edwin R. Smith, Jr., has been elected executive vice-president and general manager, and Russell M. Wheeler has been chosen chief engineer.

Chrysler Div., Chrysler Corp.—E. R. Horton has been appointed manager of industrial relations, and Walter E. Foraker has been made executive development coordinator.

Electric Auto-Lite Co.—Ralph A. Steude was made assistant general purchasing agent of the Battery Div., while Max O. Martin is now purchasing agent of the Wire and Cable Div.



Babcock & Wilcox
Co.—M. Nielsen has
been elected executive
vice-president.

Sheffield Corp.—The following general managers have been named for these new divisions: Victor Boll, Contract Services; Jack Welch, Machine Tool, Murcley, and Cavitron; William I. Wilt, Standard Production Instruments; and W. Fay Aller, Research. Benton D. Wittemeyer was made manager of fixed gages and inspection room instruments.

(Turn to page 102, please)



American Bosch Div., American Bosch Arms Corp.—Kenneth F. Leaman was named vice-president of manufacturing, and Harold R. Sennstrom was made vice-president of product development.

United Motors Service Div., General Motors Corp.—Roland S. Withers has been named general manager.



Necrology

W. A. Roberts, 57, president of Allis-Chalmers Mfg. Co., died April 12, at Milwaukee, Wis.

Maj. Frank B. Halford, 61, chairman and technical director of De Havilland Engine Co., died April 16, at London, England.

Frank A. Hiter, 63, head of the Alemite and Instrument Div., Stewart-Warner Corp., died April 9, at Chicago, Ill.

R. E. Griffin, 58, executive assistant to the general manager of Oldsmobile Div., General Motors Corp., died April 10, at Lansing, Mich.

Gordon S. Yost, 59, former general purchasing agent for Willys Motors, Inc., died recently, at Toledo, O.

Charles E. T. Schamps, 72, one-time advertising manager for Chrysler Corp., died recently, at New York, N. Y.

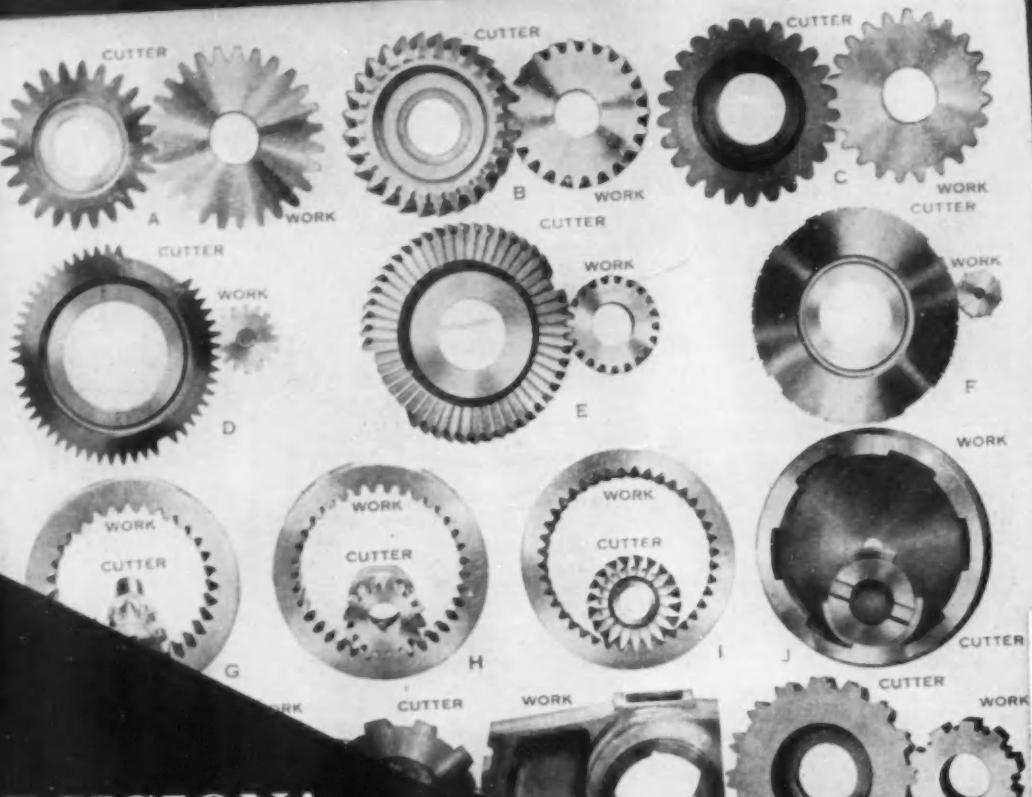
K. C. Gardner, 78, chairman of the board of United Engineering and Foundry Corp., died April 15, at Pittsburgh, Pa.

Ernest C. White, 74, co-founder of Automation Engineering Laboratories, died April 14, at Old Greenwich, Conn.

R. H. Schlotzman, 66, vice-president and controller of Bethlehem Steel Co., died April 11, at Havana, Cuba.

John Polacheck, 82, founder of General Bronze Corp., died April 16, at New York, N. Y.

Edward C. Schwab, 61, head of the Rubber Purchasing Div., U. S. Rubber Co., died recently, at New York, N. Y.



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Mergers and the Monopoly Myth In the Automobile Industry

THE marked reduction in the number of independent passenger car producers, rumors of still another "merger of mergers," and the recent announcement of a major investigation of mergers by the Federal Trade Commission in the near future, have brought the automobile industry into a prominence little less glaring than in the postwar reconversion period when a new automobile was the apparent desire of every man, woman and child in the country.

The structure of the automobile industry has been of particular interest to the economist studying business organization, competition and anti-trust policy. While the number of passenger car producers has declined drastically, legal charges have never been made that this decline has been the result of manufacturing monopoly attempts nor of collusion to restrain or monopolize the manufacture of passenger cars. Individual firms have been cited for particular practices but the history of the anti-trust statutes contains no cases comparable to those found in the tobacco, aluminum, oil, steel, motion picture and transportation industries.

Of equal interest is the general recognition that the recent automobile firm mergers are not mergers aimed at monopoly control as in some industries at the turn of the century, nor at underwriters' profits as in the Twenties, but at building competitive structures to avoid extinction as automobile producers. The big producers, rather than the merged firms, would be the primary targets in any anti-trust suit now being prepared.

In considering the possibility of an anti-trust suit let us refer to two previous Governmental actions in regard to this industry: a study of the industry by the Federal Trade Commission and the Temporary National Economic Committee investigation which touched upon the industry. Both occurred during the Thirties, a period in which business was on the defensive. In 1939 the Federal Trade Commission after an exhaustive study of the industry stated:

"Consumer benefits from competition in the automobile industry have probably been more substantial than in any large industry studied by the Commission."¹

The Temporary National Economic Committee investigating patents as a source of monopoly power chose the automobile industry to illustrate the least monopolistic use of patents by a major industry. Has the industry changed since these studies were made, as evidenced by the recent mergers? And has there been a fundamental development to negate the conclusion expressed in the Federal Trade Commission report?

To those who define competition structurally—many

¹ Federal Trade Commission Report on Motor Vehicle Industry. S.D. #468, 76th Cong., 1st Sess., Wash., D.C., 1939, p. 1074.

• • • • Its Competitive Structure through the Years is Unique and a Vital Growth Factor in American Industrial Progress

By Paul H. Banner

Paul H. Banner, the author, is a Government economist in Washington, D. C., who has devoted considerable time during the past eight years to studying the economic and legal structure of the automobile industry in this country. This article is being published by AUTOMOTIVE INDUSTRIES because of its timeliness and authoritative analysis of a problem of deep concern to the American people as they hear about anti-trust investigations by the Federal Government. Mr. Banner, previous to his present position, which is classified, was an industrial economist with the Board of Governors of the Federal Reserve System and Office of Price Administration.

PART I

of Two Parts

small producers—the automobile industry is in a regrettable state. But, using performance as a criterion, no such conclusion can arbitrarily be stated. Our structural criteria are unsatisfactory and it is proposed by a review of relevant industry history to indicate why the number of producers alone is insufficient to judge industry competitiveness.

The Number of Automobile Producers and their Market Shares

When we consider market shares of passenger car producers we are prone to look at the early postwar performance when the independents were assured of a significant market share as the result of Government raw materials allocations. In the prewar period the Big Three held over 90 per cent of the domestic market for a significant number

of about one-fourth of industry output into one firm by 1909. In this latter year the Everitt-Metzger-Flanders Co., whose output was sold by Studebaker, accounted for 12 per cent and the Ford Motor Co. for 10 per cent. Thus in 1909 the top three firms produced almost one-half of the entire industry output. Four years later the leading three firms accounted for more than one-half of industry output. By 1915 seven firms—Ford, General Motors, Willys-Overland, Studebaker, Maxwell, Dodge and Hudson—produced 70 per cent of industry output and by 1920, six firms produced 85 per cent.

Thus the belief that in the early period of the industry there were many firms closer in size is erroneous. Those firms still in existence today historically accounted for a large share of output. It is true that certain firms which were of considerable size are no longer in existence. But if we consider the Maxwell and Chalmers firms to be identical with their succeeding organization, the Chrysler Corp., then we can assume that the third largest firm today was always a firm in existence.

From 1909 to 1913 Studebaker occupied third position. In 1914 Willys moved into third place and in 1915-16 it displaced General Motors in second place. In 1919 Dodge achieved third position and from 1923 to 1927 third place shifted annually: Willys—Dodge—Hudson—Dodge—Hudson. In 1928 the acquisition of Dodge by Chrysler moved the latter firm into position as one of the Big Three producers, an unchallenged triumvirate thereafter. In most cases the firms holding fourth, fifth and sixth places were also firms which are still in existence.

In seeking the explanation for fewness of producers in



A few of the many hundreds of car makes on the American market since the early days of the industry

of years. From 1933 to 1942, in only two years did they fail to capture this percentage and in no year from the beginning of the depression to the onset of the war did any individual independent producer achieve five per cent of the domestic market. (See Table, next page).

If we delve more deeply into industry history we find that while there have been hundreds of producers, their individual shares were generally minuscule. Almost from the beginning of the automobile industry's history a few dominant firms existed. In 1905, for example, it is estimated that three firms produced about one-third of industry output—Cadillac, Ford and Oldsmobile. In 1908 Buick was the leading firm in the industry and the organization of General Motors in that year resulted in the consolida-

and the lack of new entrants into an industry in which it is clear that there has been no conspiracy to restrict entry or to force exit, the structural characteristics of the industry and its product must be considered. Two historical factors clearly emerge—the trend toward a relatively standardized low-priced product and the high capital requirements for both production and distribution. This combination resulted in continued pressure upon smaller firms throughout the formative years of the industry. Merger was a means of raising capital and reducing costs. This pressure was continuous and by the onset of the depression had fairly well shaken down the industry. Prior to that time many producers were losing money. Firms like Durant Motors, Graham-Paige, Jordan, Moon and Peerless were

losing money in the years 1927-1929 and smaller firms had been forced out earlier. The depression accelerated a trend by concentrating precipitously consumer purchasing power in the low-priced field. The market share held by Chevrolet, Ford and Plymouth rose from 56 per cent in 1929 to 72 per cent in 1934. The very poor fourth position held by any firm since the onset of the depression is indicative of the commanding position the industry leaders assumed by their dominance of the low-priced field.

Market shares among the Big Three have not been stable, however, and it is possible and even probable for changes to occur. Ford's dominant position in 1921, considered impregnable, evaporated quickly. The independents are small but only relatively so. In absolute size they are tremendous industrial giants. There is no assurance that the top three are permanently on top. No firm has yet equaled Ford's 1921 record of 57 per cent of industry output. In 1923 Moody's reported:

"A company producing to sell under \$1000, or much under it, is undertaking the almost impossible task of competing with Ford."²

In 1921 consultants advised General Motors to drop Chevrolet. Yet, four years after Moody's analysis more Chevrolets than Fords were sold. Nothing more need be said concerning this advice.

Mergers

In an industry in which there are relatively few surviving producers and in which a small number of firms account for a major part of industry output, it is usual to find a long history of mergers, competitive warfare ending in consolidations, and agreements among survivors. The automobile industry does not fall into this pattern. Among the nine producers in existence prior to the recent mergers only one is the product of an avowed attempt at combination. Dominance was not secured by merger but by product development. Attempts at mergers have been plentiful, however, and the history of merger failures is more lengthy than the tale of successes. General Motors is the only example of successful merger. The Chrysler Corp. was salvaged out of the remains of a string of unsuccessful merger efforts. The small number of producers cannot be ascribed to trusts or mergers driving competitors from the industry, but to the economies of scale in manufacturing automobiles. In short, the industry cost curve is decidedly downward sloping until a considerable level of output is reached. To define the optimum size firm is difficult, if not impossible, but it is hoped that the succeeding discussion will indicate not only that size is necessary in the industry but that size characterized by horizontal integration—complete market coverage—is an economic advantage. It allows increased adaptability to market conditions.

In William Durant and Benjamin Briscoe are found the major organizers of combinations in the automobile industry. It was Durant who organized General Motors after a larger combination, which was to have included Ford, Buick, Reo and Maxwell, fell through. Durant organized General Motors in 1908 after acquiring the Buick Motor Car Co. four years previously and building it up to the largest automobile firm in the country. General Motors was organized as a holding company to acquire the stock of the Buick firm as well as others. It held an option to buy the Ford Motor Co. but the option could not be exercised because of a lack of cash resulting from other purchases. By 1910 General Motors marketed 10 brands of automobiles representing 21 per cent of the entire industry output.³ Durant was so over-extended, however, that in order

for the corporation to raise capital onerous conditions, including the relinquishment of control of the organization by Durant, had to be met. The market share of General Motors declined from this point and leadership was not regained for almost two decades. In 1911 Durant organized the Chevrolet Motor Co., a firm which grew rapidly in the next few years. By offering an exchange of stock to holders

THE PASSENGER CAR INDUSTRY

Percentage of Total New Car Domestic Registrations

Year	Chrysler	Ford and General Motors	All Others	Highest Percentage Held by an Independent
1925	71.9	28.1		6.8
1926	74.2	25.8		6.1
1927	68.4	31.6		8.6
1928	67.5	32.5		7.6
1929	75.6	24.4		6.5
1930	83.4	18.6		3.6
1931	83.1	16.9		3.2
1932	82.8	17.2		3.4
1933	90.1	9.9		2.6
1934	90.9	9.1		3.2
1935	91.5	8.5		2.8
1936	90.6	9.4		2.9
1937	88.7	11.3		2.7
1938	90.3	9.7		2.6
1939	89.2	10.8		3.2
1940	90.1	9.9		3.0
1941	90.3	9.7		3.1

WORLD WAR II

1946	85.49	14.51	4.69
1947	84.75	15.25	3.25
1948	80.90	19.10	4.10
1949	85.60	14.40	4.12
1950	86.98	13.02	4.24
1951	86.79	13.21	4.08
1952	85.79	14.21	3.80
1953	90.52	9.48	2.81
1954	94.43	5.57	2.43*

* S.-P. Corp.

of General Motors securities Durant recovered control of General Motors in 1915. From 1916 to 1920 General Motors underwent further expansion. In 1920 Durant became so heavily involved in stock market operations that it took the du Ponts, aided by J. P. Morgan and Co., to take over his obligations to prevent a shaking of the entire stock market. Durant left General Motors but not the industry

(Turn to page 150, please)

² Seltzer, Lawrence H. *A Financial History of the American Automobile Industry*. Boston: Houghton Mifflin, 1928, p. 37. Among the firms acquired in this initial expansion of General Motors were the Buick Motor Co., Cadillac Motor Car Co., Olds Motor Works, Oakland Motor Car Co., Rapid Motor Vehicle Co., Reliance Motor Truck Co., the Carter Car Co., Marquette Motor Co., Northway Motor and Manufacturing Co., The Welch Co. of Detroit, Elmore Manufacturing Co., Jackson-Church-Wilcox Co., Champion Ignition Co., Michigan Motor Castings Co., Oak Park Power Co., Welch Motor Car Co. Federal Trade Commission, Report on Motor Vehicle Industry, H. Doc. 468, 76th Cong., 1st Sess. Washington: Government Printing Office, 1935, p. 443.

³ Moody's Investment Letter, March 29, 1923, p. 187.

Internal Engine Parts TELEVISIONED in Operation

DURING the recent Open House held by the National Bureau of Standards at Washington, D. C., a system for X-ray televising the internal parts of an operating engine was displayed and demonstrated. The X-ray televising setup used highly penetrating radiation from a 50-million volt betatron combined with a technique recently developed at the Bureau for converting high-energy X-rays into visual images. Shown clearly were the moving piston, connecting rod, and other parts in the televised X-ray image of a small one-cylinder engine. By means of this technique it should be possible to televised the internal operation of a wide range of mechanisms, such as automotive and aircraft engines, pumps, and other devices.

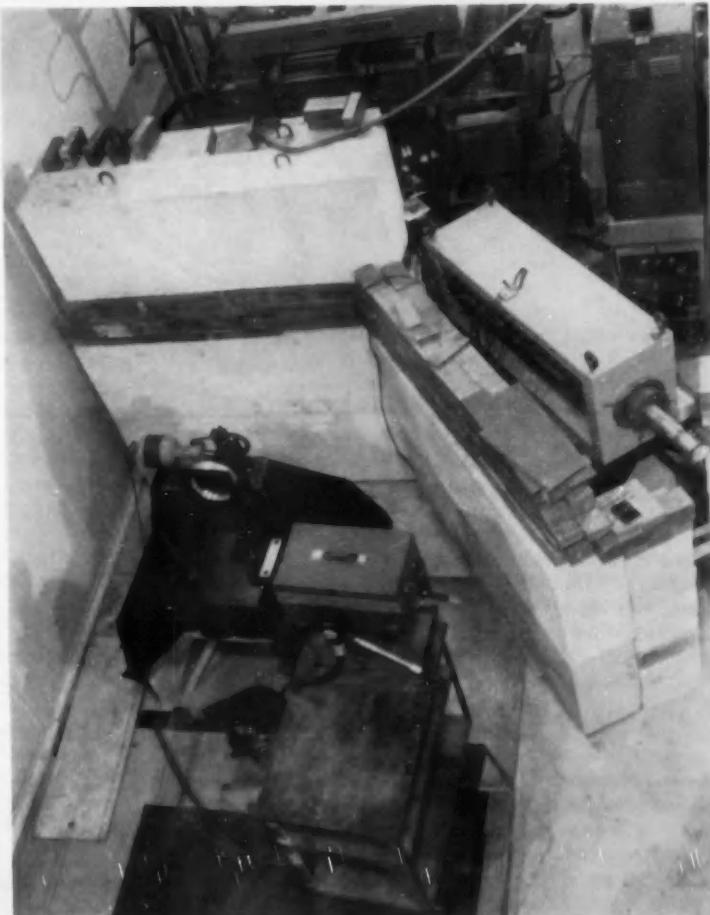
Because of their greater penetrating power and lower scattering, high-energy X-ray from betatrons and synchrotrons produce sharper images than do lower-energy X-rays, allowing the observation of greater detail and the detection of more minute

(Turn to page 116, please)

Experimental set-up used for X-ray televising the internal parts of an operating mechanism. A small single-cylinder compressor is shown on the black cloth in position for X-Ray examination. High-energy X-rays from the Bureau (background) fall on the compressor after passing through a slot in the heavy radiation shield made of concrete slabs and lead bricks. The sodium iodide crystal mounted just in front of the compressor converts the resulting X-ray into a visual image, which is reflected by a mirror to the television camera placed outside the direct X-ray beam.



X-ray image of single-cylinder air compressor as seen on a television picture tube.



Special Hardenable Iron Developed for Tappets

By
Herbert
Chase



FIG. 1

Photomicrograph (500X) of a section of a chilled iron tappet body normal to the face, showing the effect of scuffing that results in a pick up metal deposit being welded to the face.



FIG. 2

Photomicrograph (500X) of a section of a chilled iron tappet normal to the tappet face showing the effect of fatigue failure that results in metal breaking from the tappet face, at top.

NORMALLY such materials as chilled cast iron and carburized steels have been employed with reasonable success for hydraulic valve tappet bodies. These alloys do not, however, exhibit all the properties desired for this application. Maximum performance has been accomplished by the use of another material produced under exacting specifications for high speed, high compression engines.

Tests made on tappet bodies for nearly all passenger car engines of high compression, high speed type indicate that they ultimately fail because of scuffing (metal pickup), fatigue failure or corrosion or from a combination of two or all of these factors. Scuffing and fatigue are attributed largely to the heavy loading that occurs, especially at high speed, in engines that have to employ heavy spring pressure. Corrosion is enhanced, at least in some cases, by additives employed in certain oils intended to satisfy extreme pressure service requirements. This corrosion eventually leads to early fatigue failure by pitting of the tappet face, but it is not the only cause of such failures.

Scuffing of a chilled iron tappet face results in the pickup of metal which is actually welded to the surface. A typical failure of this type is shown in the

etched section of a tappet normal to the tappet face, Fig. 1, at 500X. A similar section, Fig. 2, at 500X shows a typical failure involving actual metal fractures that cause pitting of the tappet face. Figure 3 is a photograph, enlarged about 2X, of a tappet body whose face exhibits both fatigue and scuffing. Pits have been formed as a result of metal fatigue in the central area. Marks that have formed at acute angles to radii indicate scuffing in the outer area. These

Hardenable Alloy Iron for Tappets

(Chemical analysis mandatory)

Total Carbon	3.10 to 3.30%
Combined Carbon	1.00 to 1.20%
Silicon	2.10 to 2.30%
Manganese	.70 to .90%
Phosphorus	.20 Max.
Sulphur	.10 Max.
Chromium	1.00 to 1.25%
Molybdenum	.50 to .70%
Nickel	.40 to .70%

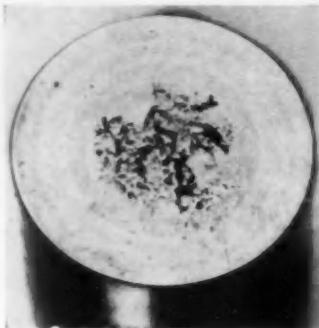


FIG. 3

Tappet body the face of which is pitted at the center because of fatigue failure. Marks radiating in the outer area indicate that scuffing action also has occurred.

three illustrations afford a clear indication of the types of failures that many manufacturers are seeking to avoid.

Much research has been done in an effort to overcome these troubles and such research conducted by Chrysler Corp. Metallurgical Laboratories and foundry facilities has resulted in developing a hardenable alloy iron tappet body that is substantially free from the difficulties named.

Specifications for the new tappet body are especially exacting and require a specific type of microstructure attainable consistently only by foundry procedures that are kept under precise control. Specifications are unusual and, in part, of a nature not previously applied in quantity production of the type dealt with here.

Chilled iron commonly employed heretofore in tappet body production has, on the chilled surface (obtained by the use of a carbon mold insert) a structure like that in Fig. 4, and that includes ferrite and pearlite islands in a carbide matrix. Furnace hardened alloy iron castings, as now specified by Chrysler have a structure like that in Fig. 5. Both of these photomicrographs are of Nital etched specimens at 750X magnification.

Tappet body green sand castings are solid cylinders approximately 1 in. in diameter and 2 in. long. They are supplied to Eaton Mfg. Co. which machines them within close dimensional limits, Fig. 6, but first inspects them for compliance with all specifications. Subsequently, hydraulic components are applied before shipping the assemblies to Chrysler engine plants.

Chrysler's intense effort to develop quickly a superior tappet body led to devising and applying accelerated tests because service tests alone consume too much time to accumulate required comparative data. In the setup used for testing, spring pressure of 235 lb. (equivalent to a 60 per cent overload) was applied and test cycles each included a two-hour run of two speeds: 1200 and 3600 rpm of the crankshaft, using SAE 5W oil at 200 and 220 F. This cycle was repeated, with cooling between, until typical chilled iron failures occurred. Some tests at 4400 rpm also were made.

Such tests are not directly comparable with service conditions but provide an index by which a sufficiently satisfactory correlation with actual service tests was attained. Typical tests at 4400 rpm showed nine out

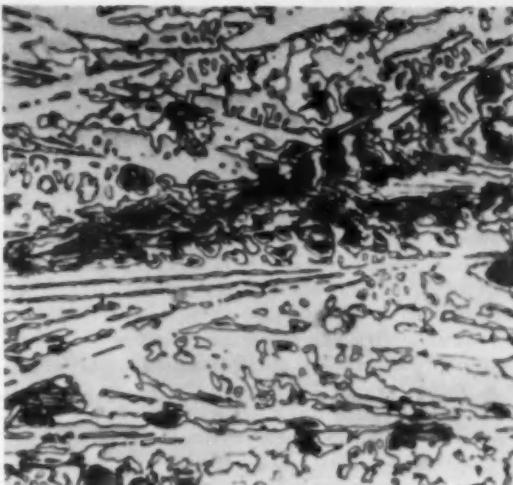


FIG. 4

Photomicrograph (750X, Nital etch) of chilled iron on the face of the type of tappet now being discarded. Ferrite and pearlite islands appear in the carbide matrix.

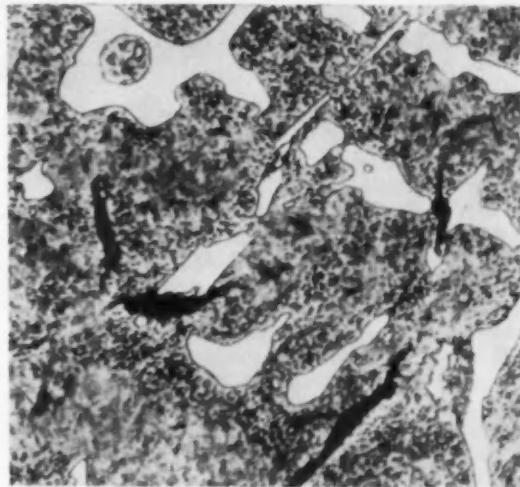


FIG. 5

Photomicrograph (750X Nital etch) of furnace hardened hardenable iron showing the microstructure of the new form of tappet body adjacent to the bearing face.

of 16 chilled iron tappets severely scuffed after four hours of running. As against this, only one hardenable iron tappet was slightly scuffed after 50 hours of running. In a test at 1200 rpm, five chilled iron tappets showed fatigue failures in 40 hours of running while no hardenable iron tappets failed in 1000 hours of identical runs.

Hardenable iron has undergone 500 test cycles without failures, whereas the best results with the older chilled iron was 30 cycles without failure. More-

over, hardenable iron has not been found susceptible to fatigue failures brought about by variations in additive oil composition, such as have caused frequent failures with chilled iron, as already indicated.

All tests were made against Chrysler standard cast camshafts which are cast to 269-302 BHN after which cams are flame hardened to 50 Rc min.

Before adopting hardenable iron, tests were made with hard facing, wrought metals such as nitrided steel, 51410 stainless steel, and SAE steels Nos. 1016, 1137, and 5120. Also tried were cast pearlitic malleable iron, chrome-molybdenum, and chrome-vanadium alloy chilled irons, and cast steel. None of these gave as good a performance under the conditions tested as the hardenable iron chosen, although several cost more.

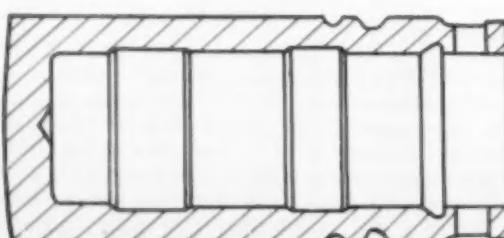
Specifications for the high strength hardenable alloy cast iron are shown in the accompanying table. This metal must be produced by the electric furnace process using best current metallurgical practices that insure good control.

Physical properties must be conducted on 1.2 in. diameter test bars 21 in. long. (Test bar B, as covered by the latest ASTM specifications for gray iron casting, No. A 48.) Tensile strength, though not considered a primary qualification, must be 40,000 psi min. as determined on the machined end of a transverse bar (specimen B, Fig. 2 ASTM specification No. A 48). Transverse strength of 2600 psi min. breaking load applied at the center of an 18 in. span is required.

Hardness of as cast blanks must be 302-341 Brinell at the center of the face end and 321 max. Brinell at the gated end. Castings must not be heat treated or annealed prior to machining. Hardness, as cast, and microstructure are the primary tests for acceptance and rejection of the green casting.

Microstructure at the center of the face of the

FIG. 6

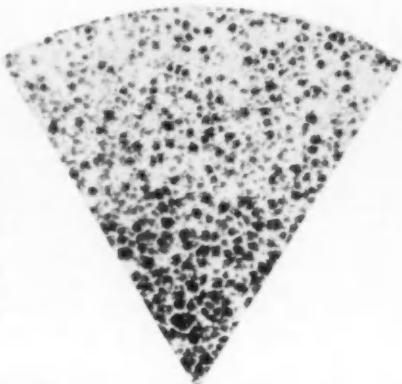


Drawing of the valve tappet body which is machined from a solid casting of hardenable iron. Standard diameter is 0.9040-0.9045 in.

The pie-cut shows Carbide distribution and type of carbide on the machined face of as-cast hardenable iron tappet body. Magnification 5X.

FIG. 8
340 BHN

Group of photomicrographs corresponding to those in Fig. 7 but applying to maximum 340 BHN as-



The pie-cut shows Carbide distribution and type of carbide on the machined face of as-cast hardenable iron tappet body. Magnification 5X.

FIG. 7
302 BHN

Group of photomicrographs of hardenable iron tappets of minimum permitted as-

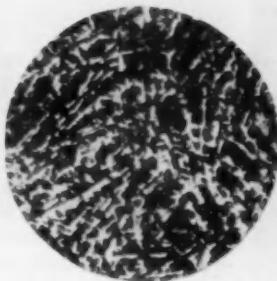
machined tappet body prior to hardening must consist predominantly of sheaf carbides, with a slight tendency toward cellular type permissible, and graphite flakes in a matrix of fine pearlite. The graphite flakes must consist of a mixture of types A and E, with type A considered the more desirable. Allowable graphite size range is 5 to 7, as covered by the latest ASTM specification No. A 247. Because of the importance of the amount and the distribution of the carbides and graphite flake on the performance of the tappets, it is mandatory that the end opposite the gated end of the blank be used as the tappet face.

To facilitate examining the microstructure and to insure that castings satisfy the foregoing requirements, two sets of five photomicrographs have been prepared and are furnished to suppliers. One set, Fig. 7, shows the distribution and type of carbide at the center, $\frac{1}{4}$ radius, and mid-radius on the machined face of an as cast hardenable iron tappet body having a hardness of 302 BHN at the center. One photomicrograph also shows the type and size of graphite at the center of the face.

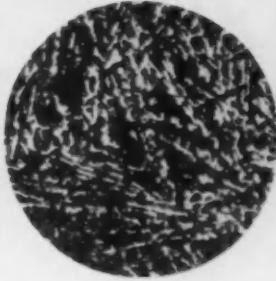
In the second set, Fig. 8, the photomicrographs are of the same type as in Fig. 7 and apply to corresponding points, but refer to 340 BHN hardness. As the



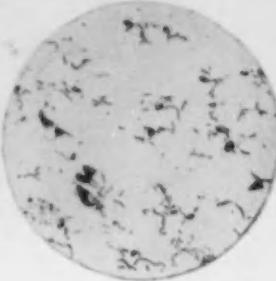
Center of tappet face
50X—Nital etch



One-quarter radius
50X—Nital etch



Mid-radius
50X—Nital etch



Type and size of graphite
at center of face, 100X.

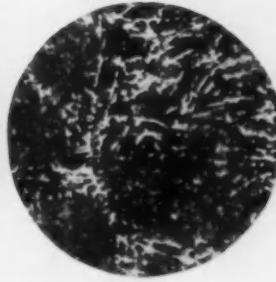
cast hardness. Checks on microstructures require that these come between the limits of the two groups.



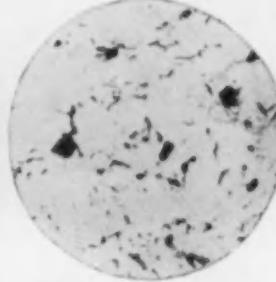
Center of tappet face
50X—Nital etch



One-quarter radius
50X—Nital etch



Mid-radius
50X—Nital etch



Type and size of graphite
at center of face, 100X.

cast hardness, 302 BHN. On each individual photomicrograph the magnification and location are indicated.

two charts represent the low and high hardness limits of the specification, it follows that the desired microstructure is attained if it comes between those of the limiting groups. Thus, the two groups enable the supplier to check specimens quickly as to microstructure in meeting the specifications that apply.

Other specifications provide that castings be clean and free from burnt-on sand, fins, runners, risers, and other cast-on pieces. Castings also must be free of cracks, blow holes, sand holes, shrink cavities or similar defects. No salvaging of defective castings by welding or other means is permitted. There are, of course, other specifications (applying to the machined bodies). After machining, the castings are heated to 1550-1600 F, quenched in oil and tempered for two hours at 350 F to yield a minimum hardness of 55 Rc.

This is followed by finish grinding of 0.005 in. from the face and OD and by applying a Lubrite finish to the tappet face, which must have 20-micro-inch smoothness.

In preparing this article, the author had the full cooperation of the Chrysler engineering department from which all facts used were obtained, hence all credit is due to those who furnished the facts. After this draft was prepared, it was decided that Maury Garwood, Chrysler's chief materials engineer, would deliver, at the March, 1955, SAE Meeting, a paper closely coinciding with that here presented. Accordingly, publication of this article was delayed by agreement for several months until the SAE paper by Mr. Garwood could be presented.

• • •

Solar Gas-Turbine Units To Be Mounted on C-131B

What are said to be the first externally mounted gas-turbine units to supply electrical power for aircraft will be installed on Air Force C-131B electronic test-bed planes now being

built by Convair-San Diego.

Two Solar T-41 gas turbine units, mounted under the wing between the engines, in special plastic and metal pods, drive generators for a-c or d-c current. Total output is said to be sufficient to supply electrical needs for

what amounts to 60 average homes.

Except for fuel supply and power starting of the gas turbine engines, the Solar T-41 units are completely independent of the aircraft. Each pod will be controlled by a console located in the forward section of the cabin.

New Production

WITH the advent of tubeless tires on 1955 passenger cars and light commercial vehicles, many ingenious and new mass production techniques have been developed by the various tire producers in placing the manufacture of these tires on an economical volume basis. Although the preliminary stages for the preparation of fabric and rubber stock remain comparatively the same, the building of the tire has been revolutionized in many ways.

This article is devoted to a pictorial sampling of some of the basic steps employed in making tubeless tires by the United States Rubber Co. in its Detroit plant.

First basic operation is on the creel (Fig. 1) a magazine rack of cord spools with the cord running continuously through porcelain eyelets to a master eyeboard where the individual cords are formed into sheets. U. S. consumes 55,000 yd of cord, on the average, per day. The creel holds about 3360 spools, about 1400 to 1600 cords running at one time, depending upon specifications. Following this, the cord is run through a latex tank, coated with rubber solids, and later goes through drying ovens to evaporate excess moisture.

Figure 2 shows the operation of cutting fabric in the right sizes to make up the plies of the tire, after calendering.

Meanwhile, the necessary chemicals are added to raw rubber stock and the resulting material comes to rubber mills, such as the one in Fig. 3 for thorough mixing and dispersion of ingredients. Among the ingredients used for the purpose are: carbon black, stearic acid, pine tar, softening oils, zinc oxide, asphalt.

Steel wires are coiled in an automatic machine (Fig. 4) to form the bead wire to which the tire is anchored.

Tread and sidewall stock are prepared separately; Fig. 5 shows rubber stock being discharged from a die.

Now we come (next page) to actual building of the tire. Fig. 6 is the first stage in making a tubeless whitewall tire, the operator being in the act of applying the first ply. He continues adding the plies and, later the toe strips, then applies the white sidewall (Fig. 7). This is followed by application of a black strip to set off the junction of white and black sidewalls.

Major contribution to tubeless tire making

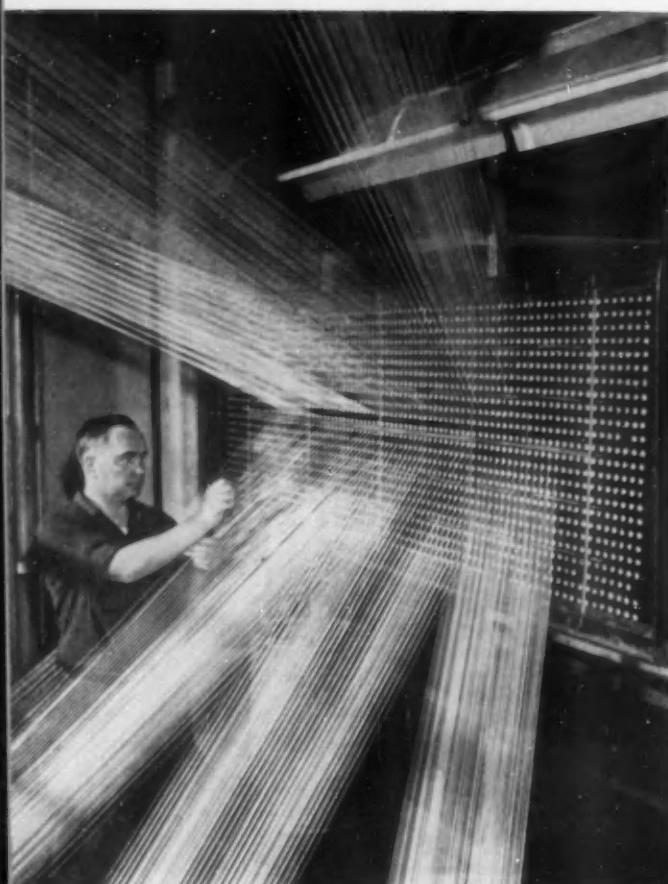


FIG. 1

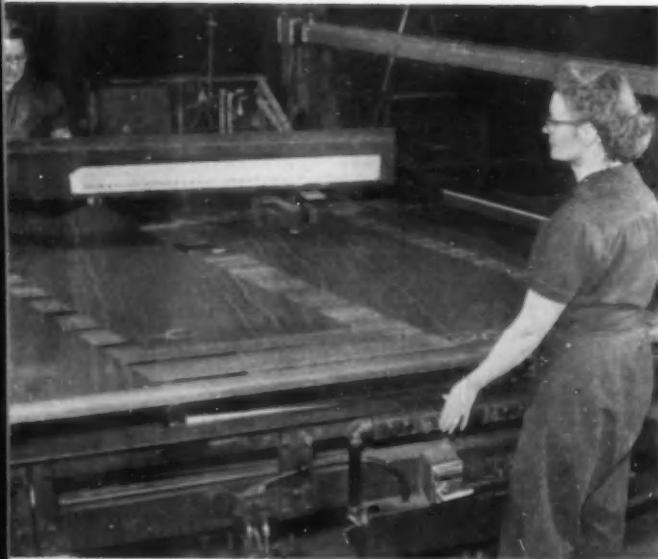


FIG. 2

Techniques Used In MAKING TUBELESS TIRES

by U. S. at this time is the development of the "bagomatic" mold technique. As seen in Fig. 8, the curing and shaping of a tire, starting with the barrel-like initial form, is done in a special mold, using a "shaping" bag which is inflated at the proper time, later deflated to permit easy removal of the finish-cured tire (Fig. 9).

Previous practice, still employed in making heavy duty tires, has been the use of a water bag inside the tire while the assembly is contained in a vacuum expander.

Although many U. S. tubeless tires are produced on individual machines such as seen in Fig. 8, the large volume tires are made in merry-go-round machines, each unit consisting of 10 building stations, indexing in counter-clockwise rotation. Each operator requires about 20 to 30 seconds at his station with the result that 10 casings are assembled and ready for curing in about $3\frac{1}{4}$ minutes, corresponding to one revolution of the table.



FIG. 3

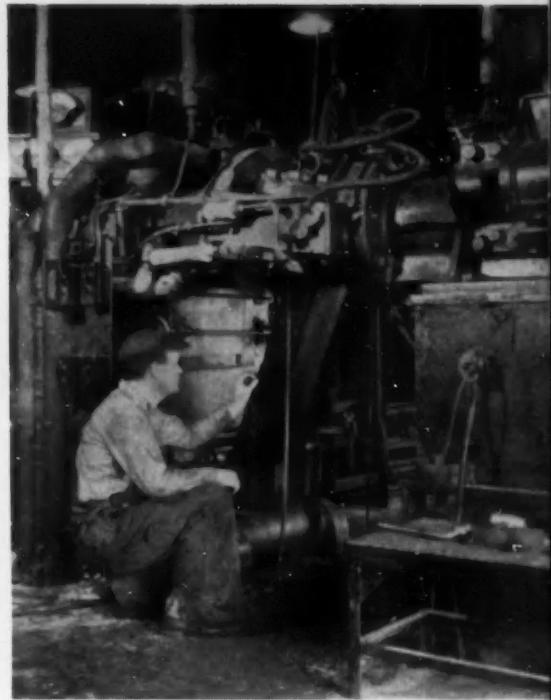


FIG. 5



FIG. 4

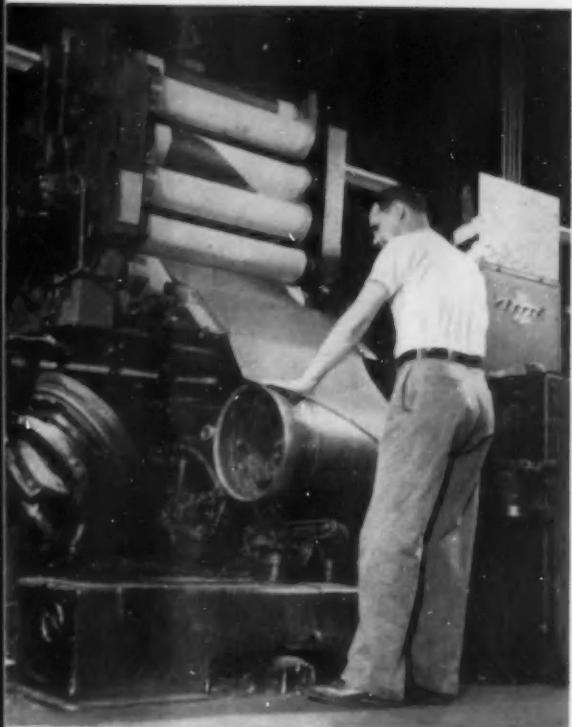


FIG. 6

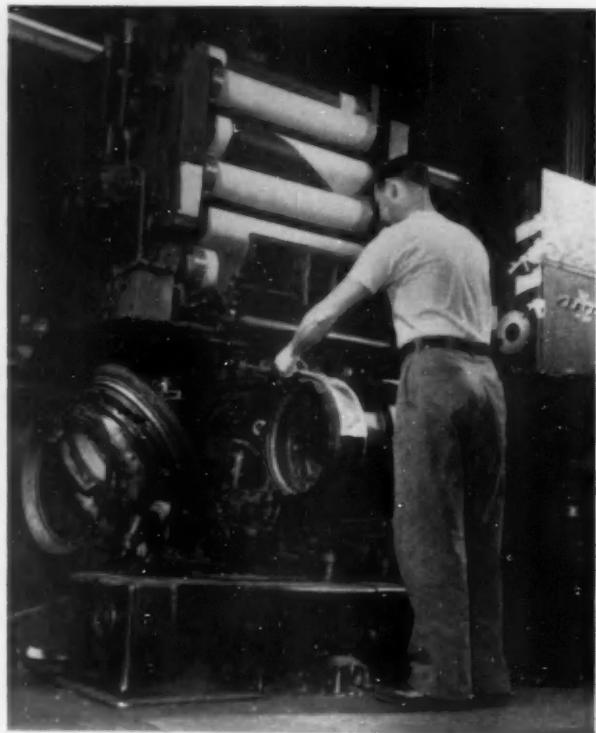


FIG. 7



FIG. 8



FIG. 9

AUTOMATIC TRANSMISSIONS Prove Efficient in ECONOMY RUN

By
MAX EPPS

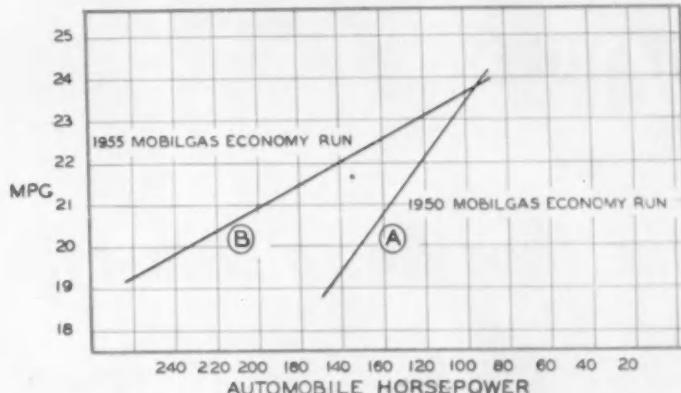
Fuels Consultant
General Petroleum Corp.
Los Angeles

ONE of the conclusions drawn from the 1955 Mobilgas Economy Run might be: horsepower are cheaper now. Such a demonstration is very interesting with the industry engaged in a horsepower race and making heavy use of horsepower claims in the selling of automobiles.

A second highlight of the run was the fact that only automatic transmissions were used and that the average miles per gallon this year was 21.56 compared to 21.84 in 1954 for all cars when the field was about equally divided between automatic and overdrive. It is also near the level of older runs that were all overdrive cars and generally over easier courses.

In order to explore this idea let's assume: first that the automobile manufacturers wish to sell the idea of higher horsepower and better performance and are faced with the fact that most people believe this costs more money. Very logically they first need some real basic proof of what costs are; second, some dramatic way of demonstrating it to the public; and third, the application of the idea to each particular selling job.

The Mobilgas Economy Run is unique in that it is a sportsmanship event under strict engineering control of the A.A.A. It represents a cross section of the industry over several years. In order to show increased value we have plotted horsepower vs miles per gallon for all the cars entered in the 1950 and 1955 runs (see chart). The 1950 results are shown in Curve A. We can interpret this curve to say that if



Relationship of Engine Horsepower to Miles per Gallon
MOBILGAS ECONOMY RUNS—1950 & 1955

a prospect wanted to buy 40 hp more capacity in his engine in 1950 he would have had to pay six miles per gallon potential loss for 40 additional potential horsepower, or 0.15 miles per gallon per horsepower.

Assume that the production cost of engines of various power ranges is constant within fairly wide limits, then the principal cost is in fuel and might have been up to \$15.00 per year per horsepower. Consider now a similar plot for the 1955 Mobilgas Economy Run, as shown in Curve B on the chart. This would indicate that an addition of 100 hp (from 100 hp to 200 hp) would cost only six miles per gallon. This is the same price we paid for 40 hp only five years ago, or a reduction to only 40 per cent of the cost. It appears that there is some basic evidence of industry progress in these Mobilgas Economy Runs, and a vehicle of proof to a large number of people. It is evidence of real improvement in both gasoline and automotive development.

One of the specific highlights of the run was the
(Turn to page 104, please)

RIGHT—

Part cutaway view of automatic adjuster

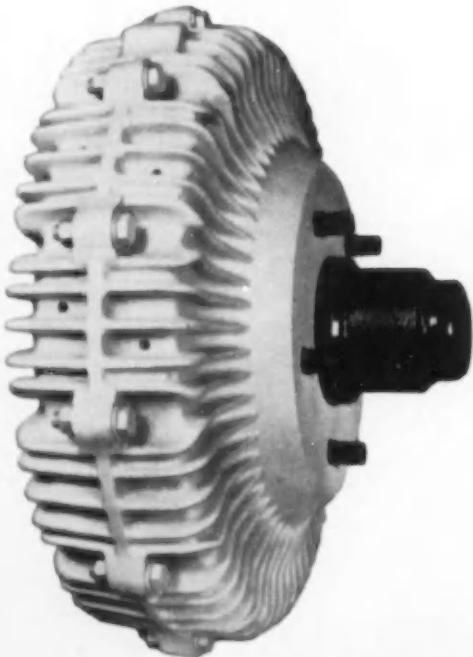
LEFT—

Sectional view showing cylinder, piston, O-ring, etc.

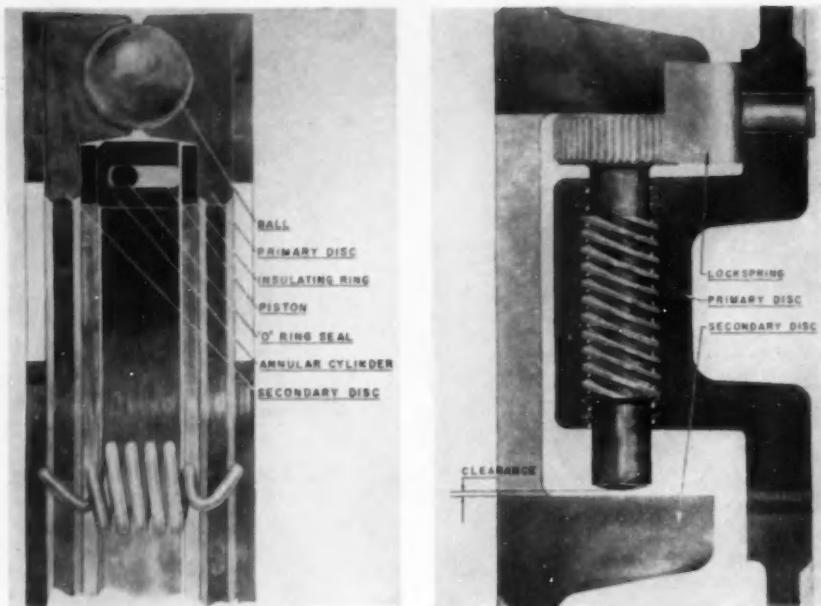
DESIGN FEATURES

of

the New Ausco Disk-Type Wheel Brakes



Ausco Double-Disk front brake assembly including hub and wheel mounting studs. A standard front hub is used and the wheel studs protrude through the outer brake housing, rotating with the wheel.



THE Auto Specialties Double-Disk brake, now being tested by several large passenger car manufacturers, features rapid heat dissipation, controlled self-energizing and automatic adjustment.

Its operating parts are enclosed within an inner and outer housing which are bolted together, the outer brake housing being bolted to the wheel. Both housings rotate with the wheel.

The housings are die cast aluminum with ferrous alloy insert rings on the inner sides which comprise the friction surface that the brake lining material bears on.

This bi-metallic construction serves the dual purpose of making an effective mechanical bond between the aluminum and the ferrous rings and providing for optimum heat transfer and a desirable friction surface. The OD of the friction surface is $11\frac{1}{2}$ in. and the ID is $9\frac{1}{2}$ in. The friction surface of the housing has a swept area of 33 sq in. per side, or 66 sq in. per brake. Brake lining area amounts to 47 sq in. per brake.

The brake mounting consists of a stamped steel splash shield and steel torque plate. The secondary or inboard disk anchors on the lugs on the torque plate, and the primary or outboard disk floats freely on the balls and is retained in position by the return springs.

The secondary (inboard) and primary disk (outboard) are die cast aluminum and organic brake lining material is bonded in segments on the outside surface

of each disk. Six ball seats are cast in each disk and coined to a minimum tolerance, with each seat located directly under a lining segment to insure equalized pressure and complete lining contact. The ball seats are inclined plane surfaces in opposite directions at equal angles which provides for self-energizing.

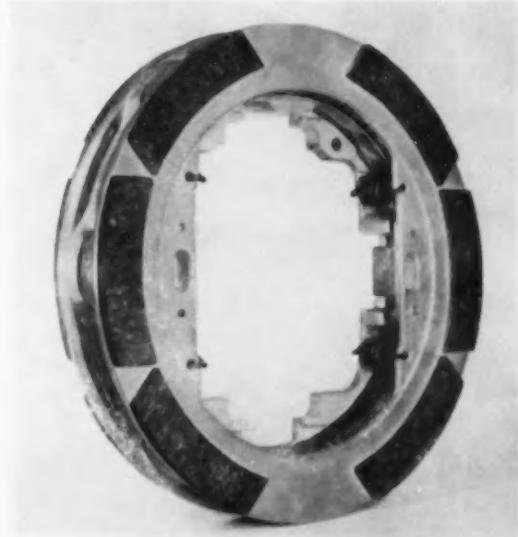
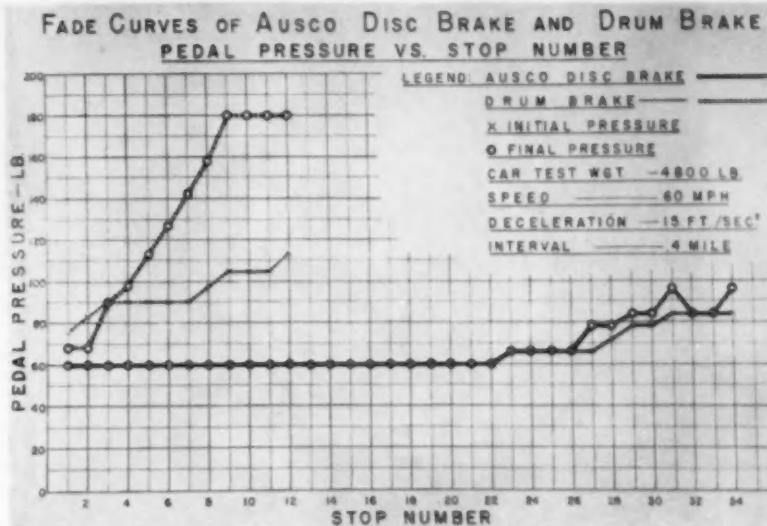
Front brakes are set up to energize in the forward direction only. Rear brakes energize in both directions so that the emergency brake as well as the service brakes are effective in the reverse direction.

Automatic adjusters compensate for lining wear to maintain constant pedal height and equalized clearance throughout the lining life without the need for manual adjustment.

There are two automatic adjusters per brake, located on the horizontal centerline 180 deg apart. As shown in the illustration, the adjusting screw is carried in a threaded boss on the primary disk. A multiple lead thread is used so that a load on the end of the screw will rotate and advance the screw. The head of the screw is serrated and a lock spring clip is used to prevent reverse rotation of the screw after it advances and retain the primary disk in a rotated position. A pair of spaced lugs are provided on the secondary disk which fit over the length of the screw. The end clearance of the screw in the spaced lugs determines the amount of running clearance between the lining and housing surface and maintains this clearance throughout the life of the linings.

As lining wear occurs, and the lug on the secondary disk contacts the end of the screw in the forward direction, the screw is forced through the boss in small increments and is locked from returning by the spring clip. The head of the screw acting on the opposite lug on the secondary disk prevents complete return of the disks to their original position. This in turn effects a separation of the disks equal to the amount of wear on the linings.

The brake is actuated by an annular cylinder assembly located between the actuating disks. The annular cylinder groove is sealed with a silicone rubber O ring seal which bears on a steel annular piston. Insulating rings are used on both sides of the cylinder to restrict heat flow to the hydraulic fluid. Annular cylinder areas can be varied front and rear to produce the desired hydraulic balance. At present a 7/32 in.



Secondary and primary disks and liners

cylinder groove on front brakes and either a 3/16 in. or 5/32 in. groove in the rear are used to produce a brake distribution ratio front to rear of 56/44 per cent or 60/40 per cent, respectively.

Due to the increased volume requirements of the annular cylinders as compared to conventional wheel cylinders, a 1 1/4 in. diameter master cylinder is

(Turn to page 129, please)

Semi-Production Department Counteracts Many Design Changes to Maintain Jet Engine Output

By Joseph Geschelin



Versatile Cincinnati Hydroform equipment is capable of producing a variety of intricately formed stampings from a simple blank. One example of a blank and the final formation is seen in this view.

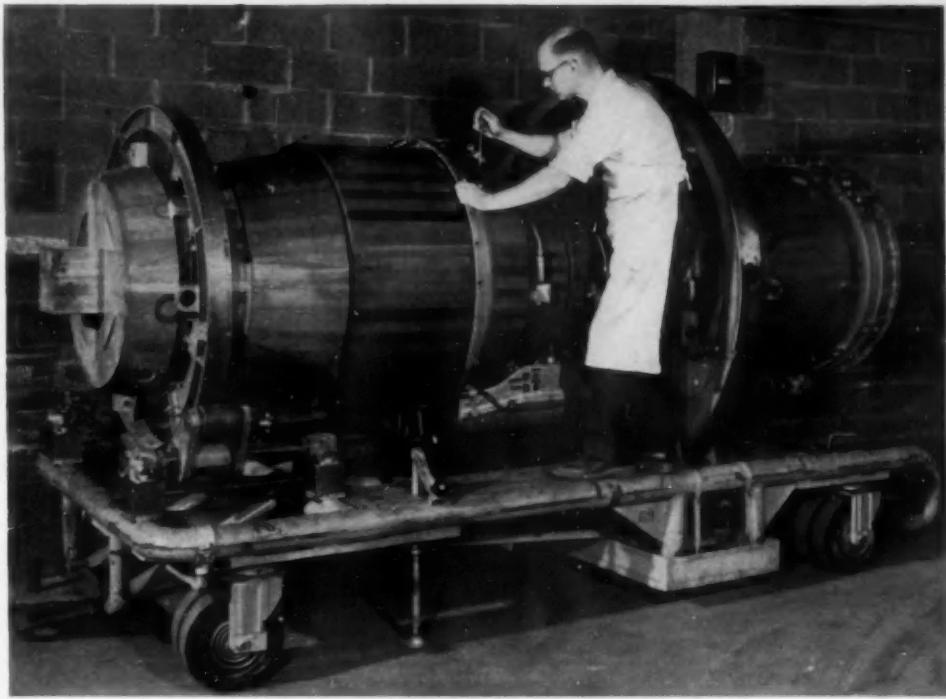


One example of the type of work being done on the Lodge & Shipley Fleturn machine in the semi-production department. At the left is the blank; at the right the finished piece.

NATIONAL security these days places military aircraft and their components in a fiercely competitive area, and demands a constant flux in product design and manufacturing procedures. It is only when a given component, such as a jet engine, is released for production that one can see at close hand the enormous management problems involved in maintaining schedules in the face of a constant flow of engineering changes.

Since this situation must be accepted as part of the present climate, it is of interest to observe how it is being met by one of the large jet engine builders. The case in point is the Ford Aircraft Engine Division in Chicago now engaged in producing J-57 turbojet engines for B-52 Stratofortress bombers and F-100 Super Sabre jet fighters, among other types.

Needless to say, the modern jet engine is a complex of all manner of parts, some fabricated from heat resistant sheet metal, some machined to exceedingly fine tolerances from a variety of heat resistant alloys. To meet production schedules all parts must be tooled for economical manufacturing, using a variety of special machine methods. Although the economical tooling of jet engine parts is a major accomplishment in itself, once this has been established management is faced with the even more serious problem



Full scale mahogany mock-up of J-57 engine prepared by the pattern department. This model then is used in making up master tube and wiring gages.

of how to maintain production in the face of manifold changes in design.

Ford does it in skillful and noteworthy fashion in its "semi-production department." Although housed under the same roof with the main manufacturing establishment, it is completely self-contained, and operates some 500 items of general purpose machine tools of every conceivable type. Furthermore, in meeting its objectives semi-production has its own tool room, its own pattern shop, and its own tool engineering.

Out of its many functions, semi-production has four major activities: it is set up to break production bottlenecks by supplying parts, hand-made if necessary, for the production department; it aids vendors by assisting them in overcoming bottlenecks while they confine their efforts strictly to production tooling; it supplies manufacturing know-how to production by working out methods and techniques for mass production of back-logged items; and it sets out to solve future production methods by selecting the most difficult—while in the blueprint stage—and overcoming them before they develop.

Semi-production at Ford AED is not to be confused with experimental production. Actually, this organization is capable of producing all components of an engine and building a complete engine. It is also fully capable of maintaining lot production of many complex parts until manufacturing can take over.

In assuming this role semi-production has harnessed the best features of all available techniques known to the art, and in this respect it will go far to encourage

and exploit new processes. Consider one example: Chambersburg Cecostamp presses are well known and were used extensively during WW II. Ford has a battery of these versatile units in the Semi-Production Department now employed in making all manner of large stampings and complex formations for stainless steel parts, using the familiar Kirksite dies. At one time Pratt & Whitney made a major engineering change in the flame protector of the diffuser case. These were tooled on Cecostamps and turned out in sufficient volume to maintain production until the main manufacturing department was able to accommodate the change in its setup.

Semi-production has in operation a large Lodge & Shipley Floturn machine. This is a comparatively new piece of equipment with potentialities still unexplored. At Ford it has been employed for the solution of some knotty problems. Here, for example, is the large dish-shaped bearing support. Initial practice was to make a large and heavy stainless steel forging, then machine it to form and size. Now, with Floturn, Ford starts with a shallow forging, develops the required formation by flowing. Production time is reduced materially, many machining operations are entirely eliminated, while still greater economy is achieved by reducing the waste and scrap of critical materials through chipless manufacturing methods.

Having achieved success on this part, the department has turned to other parts that may be similarly simplified. One recent example is the formation of the "bullet nose"—part of the burner assembly. Current

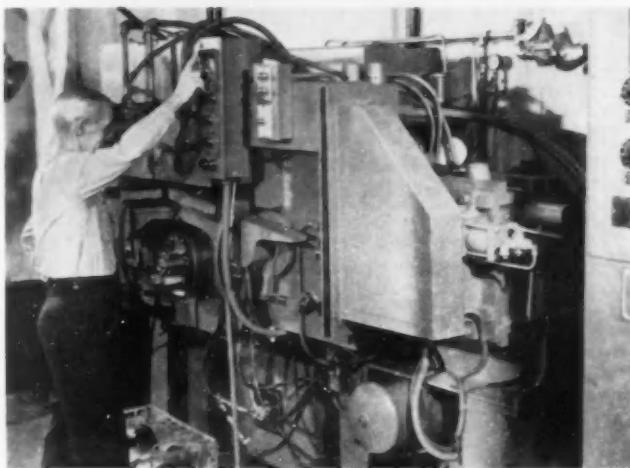
This huge Wickes special turreted lathe, at right, part of a battery of such machines, is used in the precision machining of long compressor turbine shafts for J-57 turbojet engines.

work promises to produce this deep-drawn closed end shell from stainless steel alloy in one operation, thereby eliminating some of the present steps in fabrication and welding.

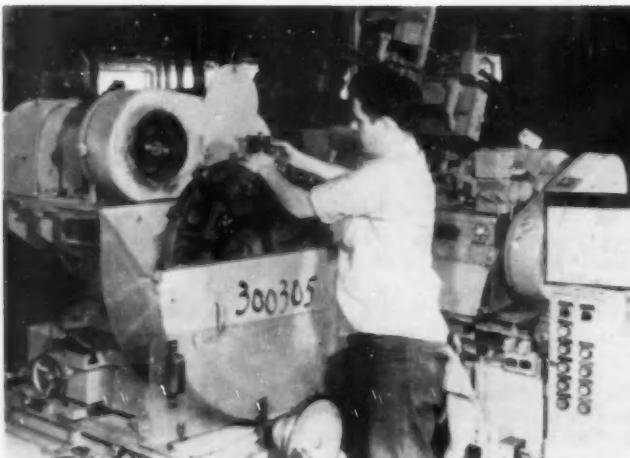
Semi-production has turned its energies to the design of special equipment as well. Outstanding example of this is a unique center drive machine for turning disks for the compressor assembly. This machine is designed to face the contours of both sides of disks simultaneously, by means of tracer control and master pattern on each side. It is noteworthy that this complex special machine employs the frame, drive and other parts of an old Wickes center drive crankshaft lathe. To this have been added tracer-controlled tool heads, special fixtures, and a Vickers hydraulic system for actuation.

Our readers need not be reminded that the literature abounds in information concerning the enormous problems involved in machining titanium. When this problem was dropped in the lap of semi-production they, too, studied the available literature; then decided to start afresh. Initial runs of titanium parts were scheduled on various machines without apprising the operators of the nature of the material. The result was amazing. In many instances the operators were able to machine titanium parts without change in their usual procedure, using high-speed-steel tools. In other cases, it was found necessary to experiment with speeds and feeds and perhaps use a cemented-carbide tool before the job was handled successfully. In still other cases, it took longer to find the right way.

In any event, Ford AED has found titanium to be rather easy to get along with. One of the toughest jobs was the centerless grinding of tubular spacers. It required time for the selection of the right type of grinding wheel, the proper relationship of the grinding wheel and regulating wheel, and spindle speeds. Once that was done, however, the job was on its way as a routine matter, now producing at high rate.



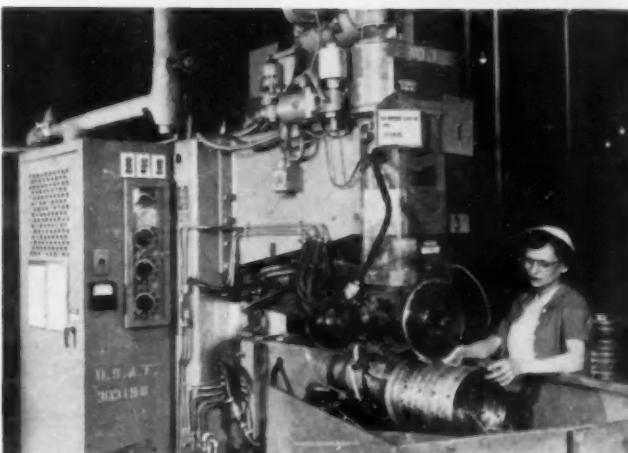
The latest development in precision welding equipment is this Scilky flash butt welder. It may be instrumental in simplifying many of the multi-stage welding operations now performed in separate steps.



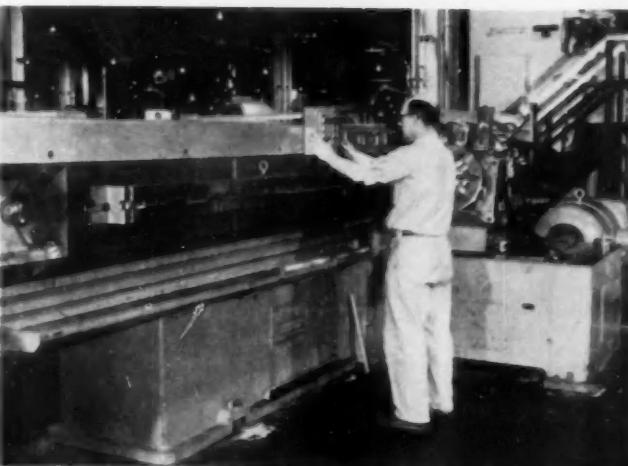
Shroud ends of turbine buckets are finish-ground in Norton grinders such as the one shown here. As illustrated, the work is clamped in a special rotary indexing fixture, loaded and unloaded manually.



At left is close-up of one of the J & L Comparators with special attachments for aligning turbine buckets in a shuttle block. As described in the text, the bucket is aligned in the shuttle block to provide proper relationship of the root and shroud ends for subsequent machining operations, then "frozen" in place by means of Cerrabend.



Typical of the many individual resistance welding operations performed in Sciaky precision welding machines is this seam welding operation on combustion chambers.



One of the latest developments in this plant is this Detroit horizontal surface broaching machine used for broaching titanium parts — a compressor wheel is this setup.

Even surface broaching of titanium has become a routine production operation. Slots in compressor wheels are broached one at a time in the big horizontal Detroit surface broaching machine, illustrated here, work being held in a special indexing fixture as shown.

Among the many things that semi-production handles is the master tube assembly. The complex of master tubing on an engine of the character and size of the J-57 poses a major problem of fabrication and inspection. It is further complicated by engineering changes and the influence of changes in size or form of any section of the engine. To meet the ever-recurring flux of changes, semi-production has built a wood mock-up model of each type of engine, using individual sections bolted together. If any section is changed to any extent, it is replaced in the mock-up and the master tubing detail altered accordingly.

Since the manufacture of a large jet engine involves an enormous amount of detail, this study now will touch on just a sampling of some selected operations in the regular manufacturing areas. One of the larger departments in the main operation is that of welding. Special equipment is available for handling the many different parts, for example, the parts and sub-assemblies for the burner sections, or "cans." For this purpose, Ford has an array of booths for heliarc welding; and a large battery of the latest types of Sciaky resistance welders of ModuWave and ThreePhase types for spot- and seam-welding.

One of the most recent acquisitions in this department is a new Sciaky flash butt welder. Initially it is for butt-welding fairly long seams. The objective is to eliminate the manual heliarc welding operations, where feasible, thus improving quality, speeding productivity, and reducing cost.

As is common practice in the aircraft industry, quality control of welding is an exacting feature. Each welding ma-
(Turn to page 106, please)

AUTOMATION NEWS REPORT

FEEDBACK

AUTOMATIC CONTROLS
PRODUCTION — VEHICLES — AIRCRAFT

By Paul Kennedy

ULTRA-RELIABLE CONTROL

Need for control systems using devices with switching properties of relays, plus reliability several times greater, challenged Westinghouse engineers to develop such devices. Disclosed last month, the resulting "Cypak director system" is applicable to both analog and digital type control situations, with the digital type perhaps the most interesting at the moment.

Cypak systems are static switching circuits, primarily for control rather than power-handling applications (see page 83). They are intended to replace relay systems, rather than individual relays, since they use a different type of circuit. Heart of the system is a pair of so-called solid state switching devices, which means, of course, that they have no moving parts. Both have the relay's on-off characteristic—that is, output remains zero (or constant) until input

reaches a certain value. At that point output abruptly rises and remains at the higher constant value despite further changes in input. This step-function characteristic of a relay is possessed by the magnetic amplifier and the transistor.

The magnetic amplifier is a magnetic-core device in which the core material has a hysteresis loop (plot of magnetism induced against magnetic field) far superior to that of conventional transformer core steel. In fact, the loop is almost as sharp as the magnetic amplifier's characteristic curve shown in the graph. This curve is obtained with proper circuitry with feedback, in addition to Westinghouse's Hypernik V steel in the core.

The transistor is a semi-conductor diode, perhaps the best known device of this type. Selenium diodes and more expensive silicon diodes have been perfected for use in industrial magnetic amplifier circuits, both as to ruggedness and cost. They, too, have a characteristic curve somewhat similar to that of a relay, but must be used in a proper circuit with feedback to provide the sharp step-function output illustrated.

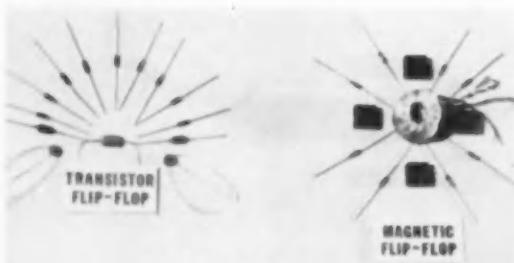
Comparing circuits of the two new devices to that of a conventional relay reveals that all have sharp characteristic curves. Therefore, they provide digital on-off-type operation; memory (stay on or off until the state is changed); insensitivity to changes in other components such as resistors; and output that can be several times the input.

In addition, the new circuits have no mechanical parts to wear out, erode or change with time. They will operate at very low power levels, using the output of sensing devices such as photoelectric cells or thermocouples without an amplifier. They may require an output amplifier, however. Speed of response is 10 to 100 times greater than that of a relay. Relays will handle either a-c or d-c directly, while static devices require a rectifier, also a semiconductor.

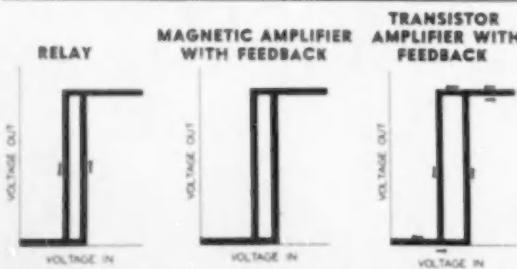
Westinghouse has established the Director Systems Dept., managed by L. W. Golden, to engineer, build and sell the systems. Development of static devices is just beginning, while that of mechanical relays has reached a near ultimate in size and weight, reported W. H. Brandt, engineering manager of the department.

"Leading economists foresee automation as the only way to keep our standard of living rising," said John K. Hodnette, Westinghouse vice-president, at the announcement. "By 1965, when our population is expected to reach 190 million persons, we will need a 50 per cent increase in gross national product. Despite the increase in population our labor force is expected to be substantially the same because the population increase will represent mostly children and persons of retirement age."

"The place where the extreme reliability of director systems will be most welcome," Mr. Hodnette declared, "is in the control of complex operations involving many different machines. Transfer machines are basic examples of integrated systems which require reliable, coordinated control. They are not, however, the ultimate in control complexity that can be handled by the director systems."



Basic components of the Westinghouse Cypak director system are semiconductors, left, and magnetic amplifier. Flip-flop refers to their use in providing an output for an indefinite time until a second input stops the output.



Characteristic curves of three types of circuits. Different circuits were used to produce identical characteristics, hence devices are not interchangeable.

LOCKHEED BRAIN

Latest aircraft plant to reveal it is using an electronic computer is the Georgia Div. factory of Lockheed Aircraft Corp., assembler of B-47 bombers and C-130A transports. The interesting feature of the IBM type 650 punched-card calculator, which will solve complex aerodynamic, stress and flutter problems, is its memory. A revolving magnetic drum, four in. in diameter and 16 in. long, remembers up to 20,000 digits, each recorded as a spot on the drum surface. It can add and subtract 10-digit numbers at the rate of 200 per second, or multiply or divide 60 per second.

ULTIMATE IN MILLING

Industry next year may be able to see just how an electronically-controlled machine tool works out in practice. The Air Force, in sponsoring development of a \$1.13 million automatic milling machine for Convair Div. of General Dynamics Corp., says it will save money as well as time in contouring aircraft prototype parts or production parts. The machine will produce parts of any shape within the second degree curves embodied in modern aircraft.

Convair reports it has detail design specifications and will subcontract a large part of the construction. The numerical control system, worked out with Massachusetts Institute of Technology, will use magnetic tape to control 18 selective motions. Convair is developing a new system of coding dimensions and formulas for the tool program engineer to use in producing the tape. A computer-director will be used to prepare the tape for this or any other machine equipped to be tape-controlled.

These data will be punched onto cards or simply on

a keyboard, into coded binary or digital numbers. The computer will transcribe the data onto punched tape. The director will transcribe from punched to magnetic tape, which will in turn operate the milling machine from a machine console.

Built-in quality control features of tape programming will eliminate the need for intermediate inspection points, a Convair spokesman stated.

The machine will have a 20-ft bed with 10-ft clearance, a turntable, two vertical and two horizontal cutting heads. It probably will be used for die sinking as well as for prototype and production wing spars, milled skins, and contoured forged bulk heads in steel, titanium or aluminum. (Illustration below.)

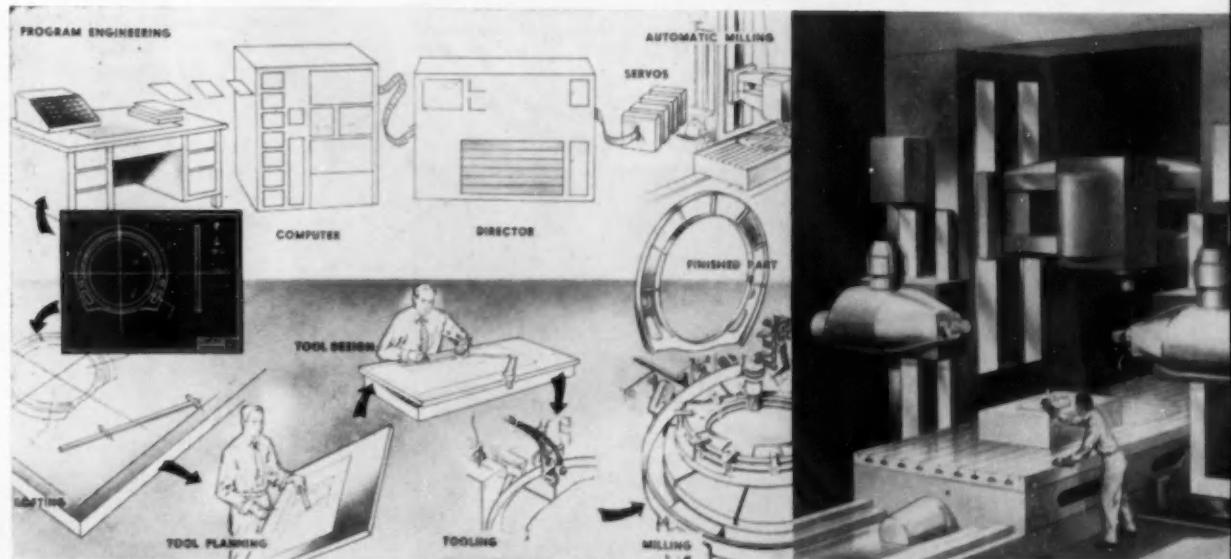
FORD EMPLOYMENT

Less than five per cent of Ford's 136,000 hourly rated employees are currently working on automated jobs, reported company chairman Ernest R. Breech recently. Hourly rated employees have averaged more than 40 hours a week each year for five years, he said, and added that only 22 per cent were laid off for as long as two weeks during the last model changeover.

NEW COMPUTER COMPANY

Minneapolis-Honeywell Regulator Co. and Raytheon Manufacturing Co. disclosed they have entered into a joint undertaking to engineer and market new large, high-speed electronic data-processing systems for use in business and Government. Paul B. Wishart, Honeywell president, and Charles F. Adams, Jr., president of Raytheon, said the project would be carried out through the formation of a jointly-owned corporation, to be known as Datamatic Corp., located at Waltham, Mass.

(Turn to page 104, please)



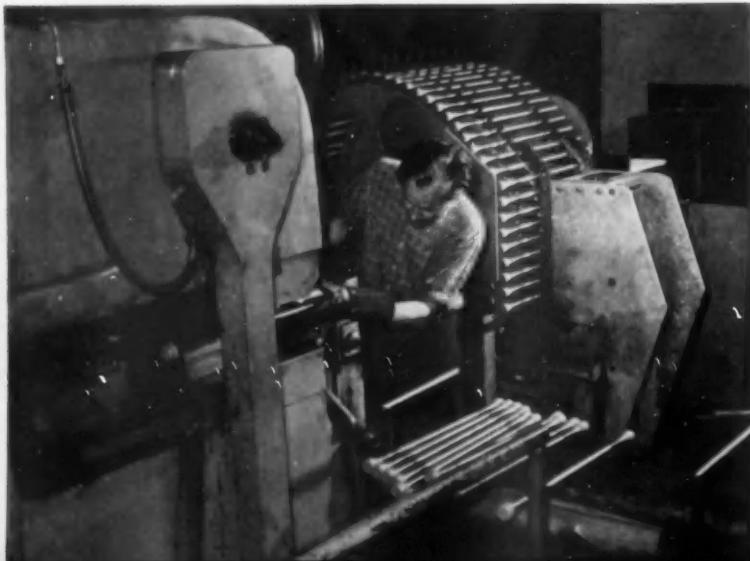
Electronic method of milling aircraft part (top) is contrasted with present method (below) in this diagram. Artist's conception of the finished milling machine on the right shows three of four cutting heads, turntable and movable bed.

Torsion Bars Mass-Produced in German Passenger Car Plant



>Loading fixture drops a bar for the commercial VW onto the 18-in. wide wheel of a Lidköping centerless grinder. Only the center stressed portion is ground, the ends overhanging the wheel.

Bar ends are carried downward through the open-ended coil of the induction heater at the right where they are heated for forging. Upset machine forms the head and cuts off the ring of extruded metal.



By David Scott

WOLFSBURG, GERMANY VOLKSWAGEN is one of the few European cars in high-volume production to feature torsion bar suspension all around. At the rear, a pair of half-width round bars with splined ends are housed in a tubular cross-member with a common gripping head at the center. They engage the trailing radius arms supporting the drive wheels and half-axles. Front link arms for each steering knuckle are suspended by two full-width parallel bars. These are laminated and of square section, and are clamped in the center of their individual housings.

As output at VW has risen to over 1000 vehicles per 15-hr day, a number of semi-automatic processes have been introduced to produce at low cost the 2000 bars of each type required daily. Rear bars for the car and the commercial "transporter" version vary slightly in dimensions, but production methods are practically the same.

Raw stock for the round bars for the car is high-carbon steel (58CrV4) 1.06 in. diam and about 13 ft long. This is turned down to 0.97 in. diam on a Kieserling centerless peeling lathe



Outside and fixed heads of a pair of rear bars are turned simultaneously on a four-spindle peeling lathe built by VW.

with rough and fine cutting heads. Work gripped by rail-mounted carriages on both sides of the machine is fed through continuously. After roller-straightening, the bar is cut into 2-ft lengths on a grinding wheel, and end-burrs are rolled over.

Bars are then centerless ground to 0.95 in. diam. A

Splines are broached on a hydraulic press fitted with a special head. The four-section broach splits open during its upward travel to release the work.



gravity conveyor carries them to a multi-fingered rotary drum which picks them up singly. After 180 deg travel, one end of each bar is passed slowly downward through the open-ended high-frequency coil of a 111 kva induction heater prior to forging. Heating time is 14 sec and final temperature 1150 C.

As the bar drops from the drum it is manually loaded in the first die of an upsetter which enlarges the end diameter on the first stroke. It is then moved to the second die which cuts off the extruded ring. This heating and forging setup is duplicated for the other end of the bar, not only to speed production but because their sizes are different. The outside head is larger than the fixed one, since experience has shown it to be more liable to fracture under stress.

For annealing, bars are stacked on pallets for transport through the 40-ft continuous furnace. Total heating time is 11 hr, with temperatures in the three compartments 750 C, 820 C, and 670 C. When bars are cool and checked for straightness, the ends are machined on a VW-built, four-spindle peeling lathe. Two bars are clamped in the double fixtures, and a pair of cutting heads at each end feed in for turning. Final diameters are 1.43 in. and 1.30 in.

Splines are cut on a push-down broach made from an Eitel hydraulic press. A four-section split broach is used. At the bottom of the cutting stroke the tool clamps are tripped by vertical stop rods and the quadrants spring open to release the work while the head retracts. The broach is closed at the top of its travel in the same way. There are two of these machines, one for each end.

Heat treatment is carried out on a nine-station rotary machine built by Brown Boveri. Sixteen bars are loaded in each carrier which is transferred through successive tanks at eight-minute intervals by an elevating superstructure. Bars hardened to 42-45 Rockwell are then shot peened, inspected on a magnetic crack detector, and washed. Final operation is coating with an elastic paint, after which they are conveyed through a drying oven.

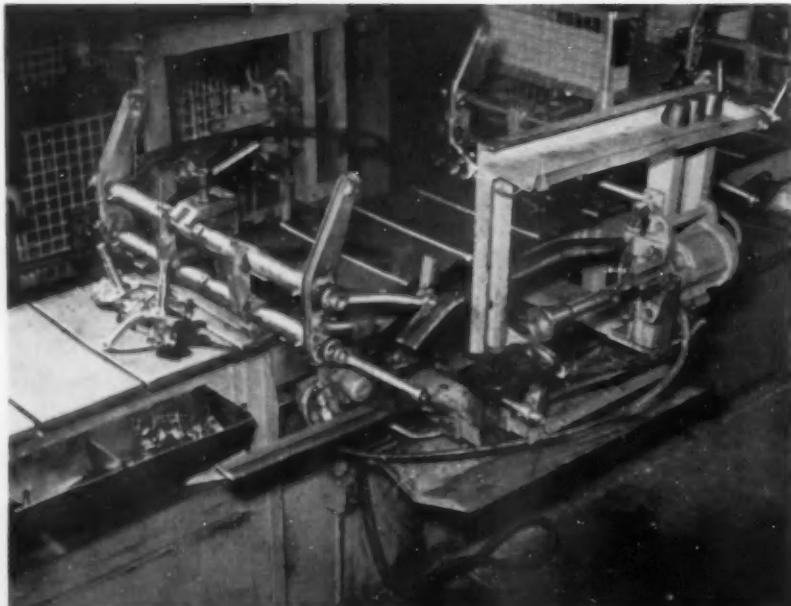
On the assembly line, bars are placed in either side of the transverse support tube of the car frame. Torque arms with splined sleeve and retaining plate are aligned at the correct angle. Splines on both bars are then driven fully home by a double-sided air press suspended overhead by a hoist. Tightening four bolts on each plate completes the installation.

Laminated bars for the front suspension are built up from narrow steel strips (50CrV4) in 37.5 in. lengths to form a section of about 0.7 in. square. They consist of six layers, the center four being full width, and the outer ones half-width strips.

Initial assembly is in a jig where the ends are



A pair of square torsion bars is inserted in the front-end unit at the start of this sub-assembly conveyor.



Front-end assembly with torsion bars and suspension arms in place. The cam tracks position the arms for easy mounting of the steering knuckle. The swinging air gun on each side indexes and shoots the synthetic rubber buffers on as the conveyor passes by.

electrically welded together to facilitate subsequent handling. Ends are then ground square, and bars are stacked in baskets holding 250 pieces for annealing. This is for four hours at 450 C. Three tapered holes to receive the set screws at the center and each end of the bar are drilled on one strip-edge face on a three-spindle machine.

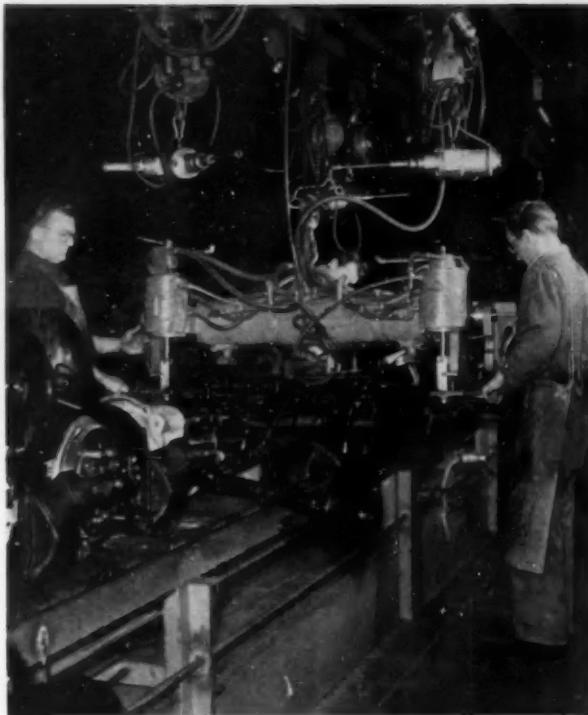
At the start of the front-end sub-assembly line a pair of bars is slipped into the carrier tubes of each unit. These are located in the central block of square internal section and retained with set screws and lock nuts. The two link arms for each front wheel are fitted on the ends of each bar and secured with set screws. Mounting the steering knuckle is eased by cam tracks, paralleling the moving conveyor, which position the arms for alignment of bolt holes.

Volkswagen engineers reported that the round torsion bars made by the present method are giving satisfactory service, with very little trouble and few breakages even after rough usage for long periods. This is despite the fact that over-all machining is confined to the initial turning and grinding of the stock.

Gradual weakening and occasional partial fractures have been experienced with the laminated bars in front, it was stated, and production techniques are under constant review. Manufacturing costs are low, however, and replacements for the customer are inexpensive. In Germany, for example, the retail price of a VW factory-rebuilt front-end assembly (including the entire suspension system, steering gear and linkage, brakes and brake drums) on an exchange basis is the equivalent of only \$70 including labor.

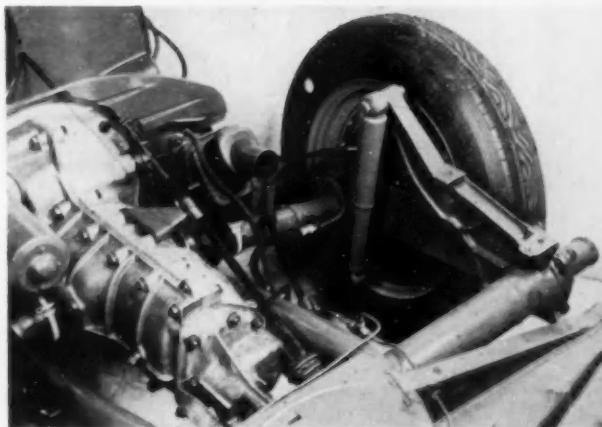
AAA Survey

The American Automobile Association has come up with some interesting figures on how much it costs to operate an automobile. According to a recent survey by AAA, the average car owner will

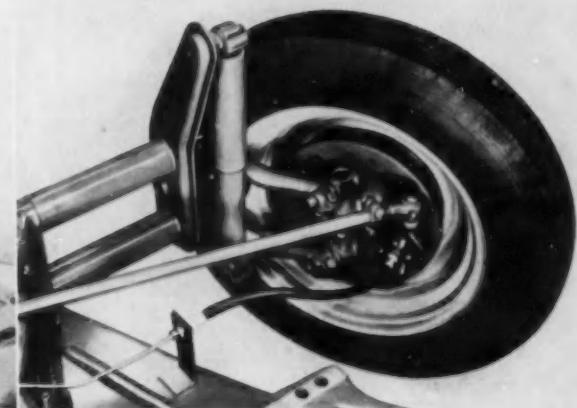


Above shows final assembly of the rear suspension. The broad, trailing torque arm with its splined sleeve is free to pivot against its rubber bushing which is compressed by the retaining plate with four bolts.

At left, double-sided air clamp on the final assembly line is lowered over the torsion bar tubular housing to press in the splines on each end.



A strong tubular cross-member houses the two rear torsion bars whose inside splines are secured by a common gripping head at the center.



Front suspension unit, showing tubular housing for the full-width parallel torsion bars.

Cites Costs of Car Operation Today . . . Higher New-Car Depreciation Ups "Fixed Costs" 10¢ a Day

have to spend from \$30 to \$40 more this year.

AAA recommends a formula of \$1.65 a day, plus 3½ cents a mile, for computing car costs. This compares with \$1.55 a day and the same mileage figure last year. AAA explained that mileage allowance is based on "vari-

able costs" of gasoline, oil, maintenance and tires, while fixed costs which include insurance, license fees and depreciation—determine the daily allowance.

AAA cited these figures for average current car operation costs: gasoline and oil, 2.29 cents a mile; mainte-

nance, .74 of a cent a mile, and tires .51 of a cent a mile—total, 3.54 cents a mile.

Fire and theft insurance, \$17.81 annually; property damage and liability insurance, \$86.65; license fees, \$16.83; depreciation, \$477.36—total \$598.65 annually, or \$1.65 a day.



ABOVE—

An in-plant portable crane helps unload raw stock from a transport. Crane operator keeps in touch with office by means of two-way radio.

LEFT—

Radio operator in office relays call for truck to unengaged vehicle nearest scene of desired action.

By Robert B. Taylor

Supervisor of Plant Layout and Methods
Rochester Products Division
General Motors Corp.

EFFICIENCY INCREASED *by Radio Controlled Trucks*

LAST year the Rochester Products Division of General Motors at Rochester, N. Y., installed two-way radios in 12 in-plant trucks and three outside pickups. Since they were installed, efficiency of the new setup has been proved over and over.

The division's in-plant trucks are of various kinds. Some are powered by gasoline engines, others elec-

trically driven. Some are lift trucks, others are tractors, and two are portable cranes. Shop operations are all on one floor, and the function of the trucks is, for the most part, to transport loaded or unloaded skids and dollies from department to department, to keep raw materials or parts supplied to machining areas, and to move miscellaneous objects at foremen's requests.

Trucks would also be used to tow the division's fully equipped fire wagon should a blaze break out. Four trucks are on fire brigade, and in an emergency the truck nearest the fire wagon hooks it on.

Six trucks plus an outside pick-up truck used for errands around the city are under the supervision of Donald T. Ver Hoeven, foreman of raw stores and interplant trucking. Eight other trucks come under the plant engineering department.

(Turn to page 114, please)

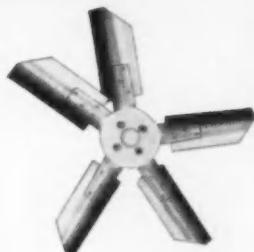
1918 TO 1955



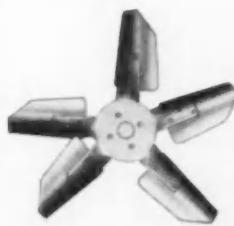
from away back THEN until NOW

SCHWITZER-CUMMINS

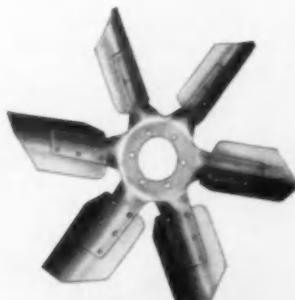
Specialists in COOLING FANS



Heavy Duty Truck Fan



Extra Cooling
Passenger Car Fan



Heavy Duty Bus Fan

Shown Here

are samples of many fine cooling fans with individual characteristics compounded for best performance of the engine and engineered, developed and manufactured in Schwitzer-Cummins plants and laboratories for blue-ribbon engines in the automotive world.

The founders of Schwitzer-Cummins Company were consultants on engine cooling in the pioneering days of the automobile. Then, with the formation of the company 36 years ago, became active as manufacturers of cooling fans and water pumps and qualified immediately as major suppliers to the then young automotive industry.

During this long stretch, a world of experience in fan design, application and manufacture has become centered in our fan division. Thousands of tough problems have been solved for our customers and much creative engineering has given the industry many "firsts" while manufacturing facilities have kept ahead of the times and remained unsurpassed for low production costs and precision work.

We are complete to develop and produce fans in an extensive variety of shapes, sizes, materials for virtually all purposes, automotive and stationary.

*May we work with you on your next
cooling fan requirement?*



Passenger Car Fan



Light Truck Fan

Other Products

- EXHAUST
DRIVEN
TURBOCHARGERS
- SUPERCHARGERS
(POSITIVE DISPLACEMENT)
- CRANKSHAFT
VIBRATION
DAMPERS
- WATER PUMPS
- OIL PUMPS
- AUTOMATIC
SHAFT SEALS
- AIR STARTING
MOTORS
- THERMOSTATICALLY
CONTROLLED
FAN DRIVES

Air Starting Motors and Thermostatically Controlled Fan Drives manufactured for and sold exclusively by the Bondix-Westinghouse Automotive Air Brake Co., Elyria, Ohio.

SCHWITZER-CUMMINS COMPANY

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Specialists in Automotive Cooling for Over a Third of a Century

Enjay now foremost butyl rubber supplier

90,000 tons yearly production of Enjay Butyl, now available from its originators, will go into varied industrial products

Enjay Company, Inc., a pioneer and leading supplier of petroleum chemicals, will market Butyl and supply advisory service in its applications.

The low price and high-level performance of Enjay Butyl allow it to replace natural and other rubbers now used in industry. Enjay Butyl is the rubber that combines high resistance to aging . . . abrasion . . . tear . . . chipping or cracking . . . ozone or corona . . . chemicals and gases . . . heat . . . cold . . . sunlight . . . and moisture.

The new Enjay Laboratories, located at Linden, New Jersey, are equipped to provide expert technical assistance in compounding and adapting Enjay Butyl to individual uses and requirements.

Distinctive properties
and low price give
Enjay Butyl wide
industrial application



Inner tubes are made of BUTYL because BUTYL holds air ten times better than natural rubber. Its impermeability to gases promises many uses.



High voltage electrical cables are made with BUTYL because BUTYL offers superior corona and ozone resistance, combined with excellent heat, cold, and abrasion resistance.



Tractor tires are made with BUTYL because BUTYL gives low tread wear and high resistance to weather, cracking, cutting, and chipping.

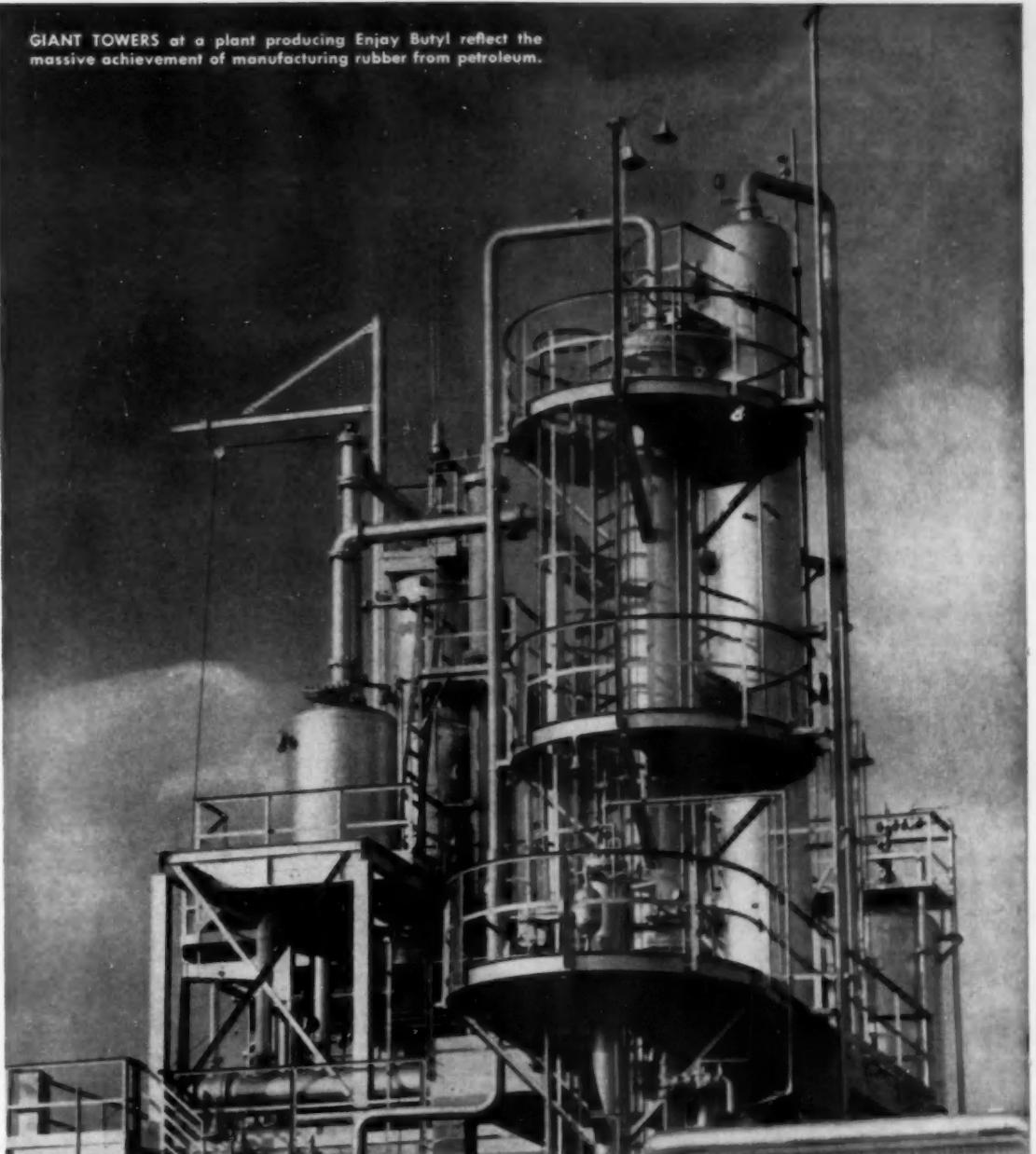


1955 cars use Butyl for dozens of rubber parts, because BUTYL has super-durable resistance to aging or deterioration on exposure to heat, cold, sun, weather, and chemicals.



Protective clothing, tank linings, belt covers, hoses, and other equipment in contact with chemicals use BUTYL because of its exceptional resistance to chemicals.

GIANT TOWERS at a plant producing Enjay Butyl reflect the massive achievement of manufacturing rubber from petroleum.



FOR FULL INFORMATION

and technical assistance on
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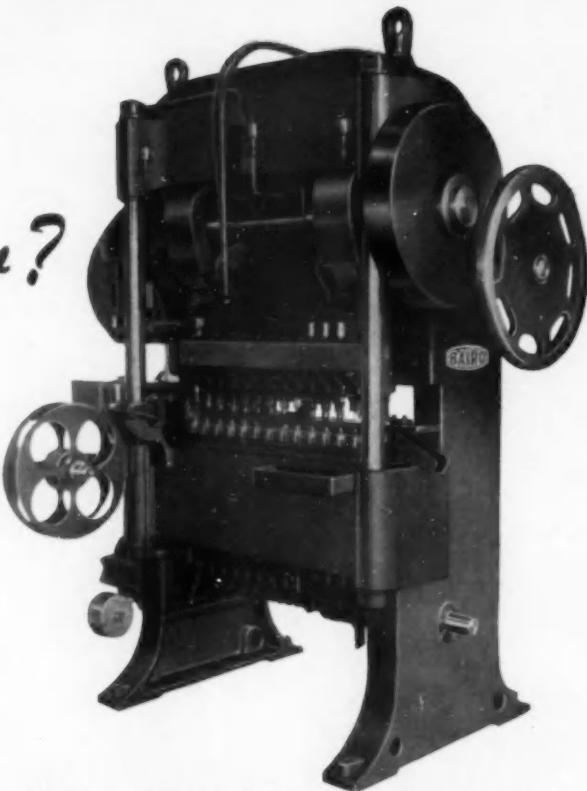
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Many types of small stamping machines can bite off coiled metal stock, but the BAIRD MULTIPLE TRANSFER PRESS cleverly chews each length into accurately formed products at the rate of thousands of pieces per hour.

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Simply stated, the Transfer Press combines, in a single cycle, operations that otherwise might require several smaller machines with an operator for each. There are almost endless tooling possibilities . . . set-ups that turn out millions of small parts at extremely low cost.

An installation of Baird Multiple Transfer Presses puts the buyer in a most favorable competitive position in a buyer's market. Better "ask Baird about it!"



Front view of the Baird Multiple Transfer Press . . . standardized in 12 sizes with rated working pressures from 5 to 55 tons. Coiled stock from $2\frac{1}{2}$ " to 4" in width is automatically fed at high speeds.

SEND FOR TRANSFER PRESS BULLETIN

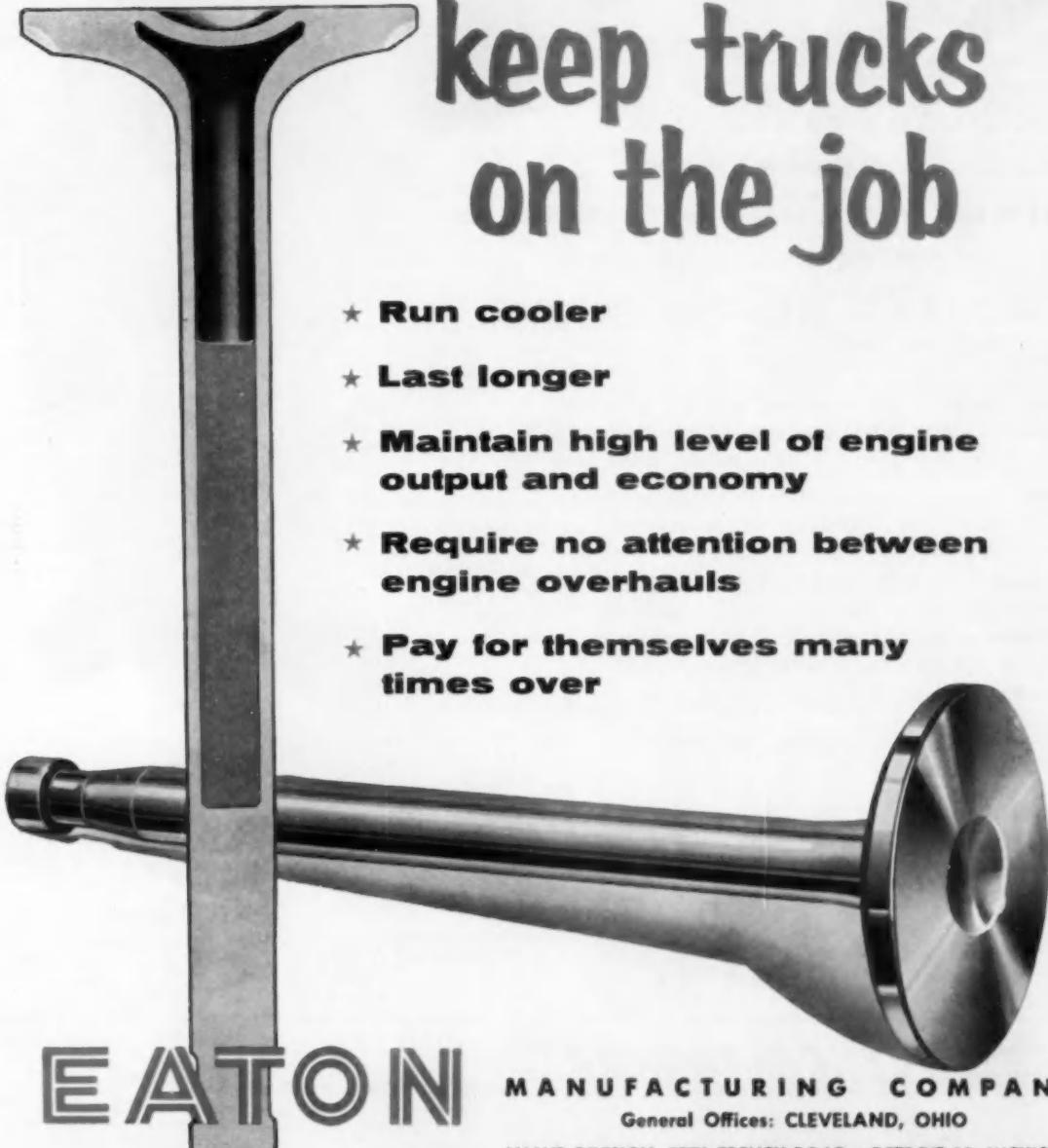
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News of the MACHINERY INDUSTRIES

By Thomas Mac New

Producers and Purchasers Both Benefit by New Setup for Immediate Delivery of Wide Variety of Straight-Side and Open-Back Inclinable Presses

March of Diamonds

Dr. H. Tracy Hall, one of the GE Research Laboratory team members responsible recently for the creation of man-made diamonds, has developed a novel method of mounting stones in diamond tools.

In a conventional mount, as much as 90 per cent of the diamond used may be buried in the tool in order to gain rigidity and prevent loss of the stone. Dr. Hall mounts a considerably smaller diamond in a shallow cavity on the surface of a single-point wheel-dressing tool.

One secret of the process is the use of titanium hydride as a "wetting agent," and a solder, such as silver-copper. The parts are brazed by induction or radiation heating in a high-vacuum system, or in an atmosphere of high purity argon or hydrogen gas. In strength tests, a small diamond tip mounted on a microtome blade and revolved at 56,000 rpm placed a force of about 50,000 psi on the bonding area. However,

this force was insufficient to dislodge the diamond.

Dr. Hall's process, according to GE, already shows promise of industrial use. The advantages claimed are four-fold: (1) The diamond is more securely anchored to its mount. (2) The wasted "root," which in many cases is three-fourths of the volume of the entire tool point, can be eliminated. (3) Much smaller diamonds can be mounted to provide the same working surface. (4) Heat transfer is better when a diamond is bonded to metal than when there is only a mechanical connection.

Penn-Texas Gains Control of N-B-P

After the tabulation of stockholders' votes cast at the annual meeting of Niles-Bement-Pond Co., West Hartford, Conn., Penn-Texas Corp. was found to have 60 per cent of the shares voted in favor of its directorial slate. L. D. Silberstein, chairman and president of Penn-Texas, was select-

ed as chairman of the board of Niles. Ten of the directors elected were proposed by Penn-Texas, while the remaining four were put up for election by a stockholders' group which allied itself with Penn-Texas Corp. Niles-Bement-Pond is the parent of Pratt & Whitney.

Presses On Sale Over-the-Counter

Clearing Machine Corp., Hamilton, Ohio, recently sent notice to its sales force and distributors that 21 models of open-back, inclinable (OBI) presses and five models of straight-side presses will be available for immediate delivery. Not only is the delivery phase advantageous, but that existing prices will prevail is equally enhancing.

Management's decision to build the 26 popular sizes in quantity was the basis of the new policy. A high production rate, of course, usually means

(Turn to page 104, please)

U. S. EXPORTS, BY COMMODITY AND AREA OF DESTINATION

1951 - 1954

(millions of dollars)

Machinery Classification	Canada and Northern No. America	Southern North America	South America	Europe	Asia	Oceania	Africa	Latin American Repubs. ¹	OEEC Countries	Total U. S. Exports	
Machine Tools and Parts	1951	15.9	2.5	4.9	45.0	2.7	1.3	.7	7.2	44.7	73.0
	52	25.1	2.8	4.3	91.5	4.4	2.3	.7	6.9	90.6	131.2
	53	27.7	4.6	4.8	75.4	6.9	1.7	1.1	9.2	77.2	125.2
	54	22.2	4.7	4.4	45.4	8.7	1.0	1.5	8.9	44.6	86.9
Other Metalworking Machinery	51	22.0	6.3	11.4	65.8	8.7	4.2	3.0	17.5	85.8	119.4
	52	28.6	8.6	10.7	63.9	10.4	5.5	4.3	18.8	63.3	131.9
	53	40.1	6.7	14.5	63.0	21.1	2.6	4.7	20.9	62.2	152.7
	54	31.0	9.2	20.5	40.3	14.1	2.8	3.5	29.4	39.6	121.4
Other Industrial Machinery	51	106.5	80.9	99.4	66.7	47.1	8.4	18.6	174.1	66.0	427.5
	52	136.0	84.7	121.0	81.1	23.9	12.2	25.6	196.5	72.9	527.3
	53	158.7	75.9	106.5	73.6	75.7	12.1	25.3	172.9	66.2	527.8
	54	163.4	83.7	108.1	80.1	79.1	12.8	24.3	182.1	66.0	551.4
Electrical Machinery and Apparatus	51	120.5	88.9	154.2	82.1	61.4	6.8	19.1	236.8	74.1	533.0
	52	164.8	103.1	134.4	92.2	78.5	13.5	21.9	229.8	87.9	606.4
	53	219.2	92.6	133.6	92.8	78.3	7.2	19.6	215.2	83.0	643.4
	54	196.9	79.6	130.1	78.9	82.2	5.3	21.1	204.3	92.7	594.1

¹ Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Republic of Panama, Paraguay, Peru, Uruguay and Venezuela. These data represent the sum of Southern North America and South America less exports to possessions and dependencies of European Nations.

SOURCE: U. S. Department of Commerce, Bureau of the Census.

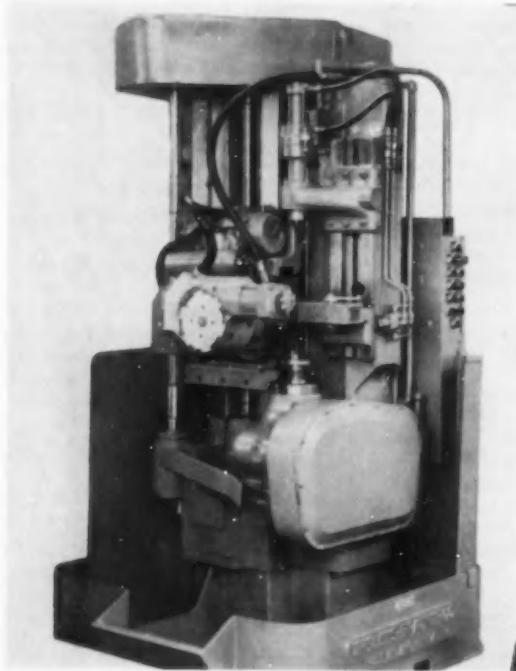
NEW

EQUIPMENT

PLANT • PRODUCTION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Heavy Duty Climb Hobbing Machine



No. 1 Tool Grinder

THE No. 1 Cutter and Tool Grinder recently added to a machine line is designed primarily for grinding and reconditioning miscellaneous small tools and cutters. It has a capacity of eight in. swing and 15 in. between centers. The new model has the cartridge type grinding wheel spindle mounting with a double row of special preloaded anti-friction bearings, packed in grease for lifetime lubrication. The cartridge type unit may be readily replaced after years of service. A reversible $\frac{1}{2}$ hp motor drive, built in to the wheelhead, provides the desired direction of grinding wheel rotation.

Grinding wheel collets are quickly interchanged by removing a socket

head screw. Anti-friction table slide provides unusual ease of table movement. Duplicate controls give the operator a choice of operating the machine at the front, right-hand end of the table; or at the rear, right or left-hand side of the wheelhead.

The 360 deg eccentric wheelhead swivel adds three in. to the conventional cross range of $4\frac{1}{2}$ in.

Utilizing precision gage blocks, a so-called Tange Bar taper setting device is based upon the trigometric function of the tangent of the angle. The operator either multiplies the tangent of one-half the known value of the included angle by 12, or utilizes the given value of the taper per foot from the centerline to obtain the correct gage block setting. Replacing either of these values with

Rated capacity in steel is 4 D.P.; distance between centers is 25 in.; maximum helix angel is 45 deg right or left; maximum hob size is four by four in.; maximum diameter with a four-in. hob is seven in. and with a three-in. hob is eight in. Reliance drive motor size has been doubled, to 10 hp. Guards are not shown. Toolstock center is in up position and tooling is for 20-in. long workpiece.

GEAR production by the climb hobbing process will be speeded with the Model 7 Type HD machine now in production. This heavy duty version of the manufacturer's Type A is offered in single, four and six-spindle machines. Similar extra and optional equipment, except for the lead differential, is available for the Type HD. Main components are described as considerably heavier and more rigid.

The welded steel base has a clean-out chute. The heavier headstock has a chip trough cast in. It no longer carries the motor and brake, as they are now on top of the machine out of the way of coolant and chips. The motor mounting is JIC-approved foot type. The heavier box column is balanced with the load distributed between the headstock and motor.

Timken bearings now are used on the spindles, to allow hob speeds up to 1000 rpm. Hob shift has been increased from two to three in. Other features include a quick return mechanism, precision shifter screw and adjustable double shift nuts to overcome backlash and end play.

The outer support takes the thrust of the arbor on preloaded ball bearings. Permanent lubrication is built in.

Three types of tailstocks are available, each with improved adjustments. The heavier leadscrew is arranged with double nuts, and a double thrust bearing on top with a double row of floating ball bearings below. It is maintained in tension. The backshaft with involute spline drive is in two sections for easier servicing. *Lees-Bradner Co.*

Circle 56 on postcard for more data

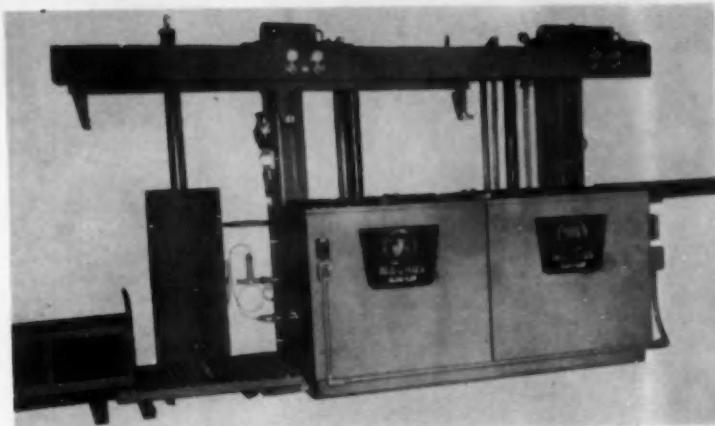
corresponding precision gage blocks, the swivel table is then accurately positioned for grinding the taper. *Cincinnati Milling Machine Co.*

Circle 57 on postcard for more data

Automatic Loading for Parts Cleaner

LATEST in the Aja Lif Automatic cleaning machine line is a pneumatic push device and loader. Work to be processed, generally in baskets, is pushed at floor level onto a lifting roller platform which automatically raises the work to the top of the cleaning machine. At the same time similar roller platforms in each tank raise to the same level. Then a push drive device with collapsible dogs above the tanks transfers each basket or batch of work one step forward at each cycle.

By means of a timing device which synchronizes the push drive with the loader, the platforms in each tank with the work on them are lowered in the cleaning solution and vigorously agitated for the necessary length of time, after which the platforms will automatically rise again at working level. At this moment the push drive will transfer the loads one more step toward the right and the process repeats itself indefinitely.



The Magnus Aja Lif Automatic with pneumatic loading equipment.

The functioning is entirely automatic.

This machine can be designed for any number of operations and for

use with solvents, alkalies, or acids. It requires no special foundation.

Magnus Chemical Co., Inc.

Circle 38 on postcard for more data

Inspection Accessory

NEW auxiliary equipment for magnetic particle inspection is said to materially increase inspection rates without obsoleting existing units. With the X-1584 Vertical Contact Adapter, no time is lost holding any small part, and the second hand is left free. Heretofore, horizontal contact units have been most widely used, and the use of vertical units

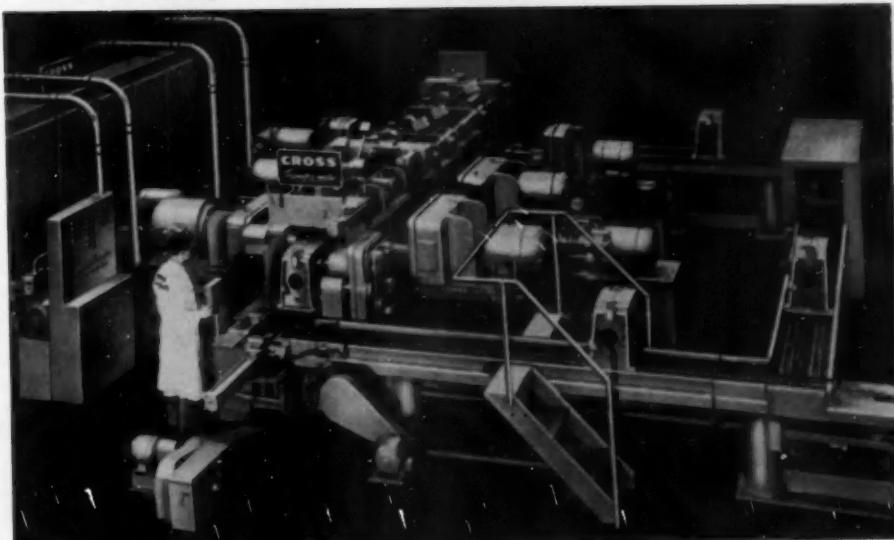
has been limited to particularly high volume applications.

The X-1584 is really a special jig. It fits any standard horizontal Magnaflux unit. Almost no installation is required, and once installed it can be connected or disconnected in two to five minutes. It comes with quick dis-connect air hoses for the necessary pneumatic connections. Cables and attachments for magnetizing

current are also provided. The accessory itself clamps on the rails with a lockshoe and draws power and air directly from the unit. The adjustable contact heads will handle parts 12 in. long and go up to 10 in. in diameter. Because many parts are more easily magnetized with a central conductor, a removable conductor is included. Magnaflux Corp.

Circle 39 on postcard for more data

Gear Housings Handled on Pallet-Type Fixtures



A nine-station Transfermatic for machining rear axle differential gear housings completes 155 pieces per hour at 100 per cent efficiency with one operator. Operations include rough and semi-finishing of the pinion bores, rough boring, semi-finish boring and tapping the cross bores. Parts are clamped in pallet-type fixtures with hydraulic power wrenches.

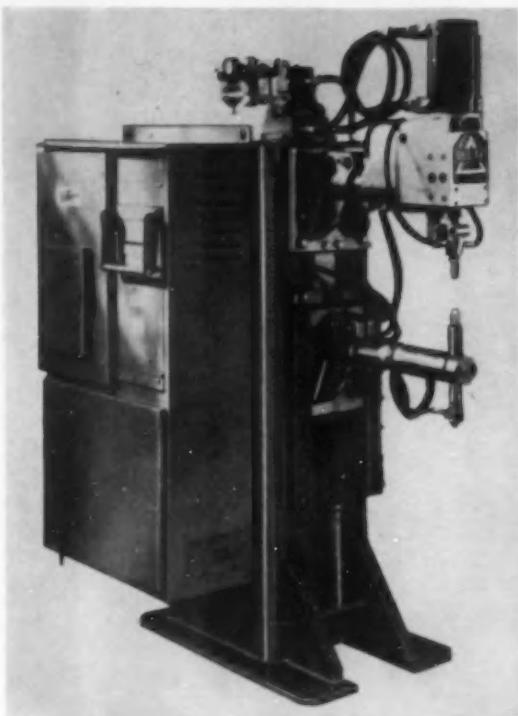
(Cross Co.)

Circle 60 on postcard for more data

NEW EQUIPMENT



Resistance Welder

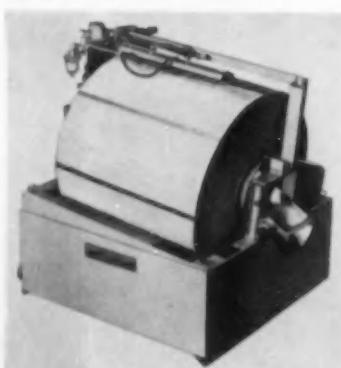


Designed for high duty cycle resistance welding on medium gage sheet metals, a new spot welder has a fabricated steel frame of formed boiler plate. The upper head features a hardened and ground, lubricated slide riding in adjustable V gibbs. An air cylinder of sufficient capacity to handle a wide range of metal thicknesses is designed to provide rapid follow-up. The lower arm is adjustable in a vertical direction from 13 in. between the arms in a closed position to 23 in. in an open position. The lower arm is also readily adjustable in a horizontal plane from standard throat depth of 18 in. to within 9 in. of the machine face. (Delta Welder Corp.)

Circle 61 on postcard for more data

Improved Filter

KOWN as the Model 10, an automatic filter rotates fresh filtering area into position while simultaneously ejecting the contaminated cake. Filtering screen is divided into eight equal parts — screw-mounted.



M-W automatic filter model 10

Filter screen material and size of screen opening can be supplied in monel, stainless steel, brass or bronze to fit all requirements.

Contaminant retained on the filter screen is removed by air pressure and is dropped directly into the exit chute. Through the filter float control the air unit is actuated only when the drum turns. That operation occurs only when the contaminant cake restricts filtering and the liquid level rises to operate the float control.

Elimination of the tuning rods permits the enlargement of the filtering area approximately 15 per cent without enlarging the floor area.

The filter may be used on an individual machine unit, or as a central filter for many units. The gallon capacity of filtration may be easily increased by adding filter drums in tandem — separately, or in the same tank to meet requirements. Murray-Way Corp.

Circle 62 on postcard for more data

Four Large Trucks

GREAT selectivity for industrial truck users is offered by four new Dynamotive gas powered electric transmission models which provide 7, 8, 9, and 10,000-lb capacities. Like the original Dynamotive, the new models are available with either standard gasoline or liquid propane (LP) engines, and can handle all attachments.

More efficient use of attachments is possible with the heavier Dynamotive units, the company states, since the heavier the truck, the smaller is the percentage of dead weight increase when the attachment is added.

These Dynamotives offer low maintenance costs, performance characteristics, and long life of a straight electric truck, plus the constant power source of a gasoline engine. The electric, infinite step transmission has no mechanical connections from engine to drive unit. It provides fully controlled power and infinite acceleration range with minimum power loss, insuring maximum economy and efficiency, according to Automatic Transportation Co.

Circle 63 on postcard for more data

Hydraulic Springs

A NEW line of semi-standard Hydra Springs using liquid compressibility has been announced, the result of shortening the chambers of standard models. These devices are said to provide up to ten times more force in smaller space than mechanical springs. For example: a unit 2 1/4 in. in diameter by 4 1/4 in. long produces as much spring force as a six-in. diameter by eight-in. long railroad car spring made with 1 1/4 in. diameter wire. Force and stroke may be adjusted by changing preload, volume or type of Comproil, a special compressible fluid. *Hydra Spring Div., Wales-Strippit Corp.*

Circle 64 on postcard for more data

Elastic Proving Ring

A 300-LB capacity turnbuckle type proving ring, in addition to showing tensile or compressive loads to \pm one per cent of indicated reading, can also apply a tensile load by taking up on the turnbuckle forks. The dial is graduated in degrees with a calibration chart furnished. For compressive loads the turnbuckle forks are unscrewed and the load is applied against the flats of the bosses. *W. C. Dillon & Co., Inc.*

Circle 65 on postcard for more data

Control System Has No Moving Contacts

Ultra-reliability was the aim in designing a control system with no moving parts. The so-called "Cypak director system" unveiled last month is a method of controlling machine tool cycles, flow processes, conveyors, transfer machines, welders and many others without conventional switches that have moving contacts. Its reliability stems from this factor, the company states.

Each setup is custom engineered from basic components—magnetic amplifiers and transistors. These devices (see page 66) take the place of conventional switching relays and electron tubes in control circuits (not in power circuits). Systems are in operation to control an automatic welder, a punch press, a spiral milling machine, hoists for steel mills, and devices in other fields. Life of the system is said to go far beyond the 20 million or so cycle limit for an electrical relay control system. *Westinghouse Electric Co.*

Circle 66 on postcard for more data

An automatic bus duct welder is controlled by either a Cypak system (above) or a conventional relay control system (below). It involves positioning, welding, starting, stopping and interlocking features.



Plating Machine Designed for Automatic Loading

THE Stevadoer automatic heavy-duty plating and processing machine was engineered to enable automatic loading and unloading. It can be adapted to single or double row plating and processing and was designed to handle almost unlimited rack sizes and extreme weights.

Delayed set-down mechanism provides independent timing in one or more tanks. Additional transfers can be easily provided. Through the use of a special timer control, a carrier arm can be made to skip any particular tank or operation as desired.

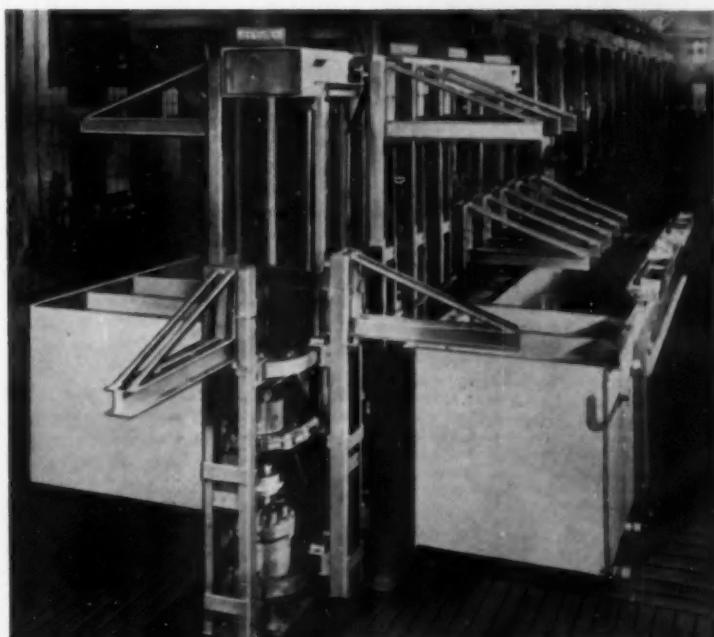
Safety and accessibility combined are added features. A 20-in. or wider catwalk can be provided between processing tanks and the mechanism on two-row machines. This permits safe and easy addition and removal of anodes, lubrication and inspection. No moving mechanism is over the solutions and all internal mechanisms are built below tank level. As a result, contamination of solutions from excessive lubrication and metallic wear is eliminated. Likewise, damage resulting from corrosive fumes is reduced since moving parts are not in areas subject to attack.

All lift and horizontal motion of the machine is accomplished by hy-

draulic power. Special controls permit independent adjustment of acceleration and transfer speeds to

accommodate extremes of weight and rack size. *Frederic B. Stevens, Inc.*

Circle 67 on postcard for more data



Load end view of the new Stevens "Stevadoer" automatic heavy-duty plating and processing machine showing some arms in elevated delayed set-down position.

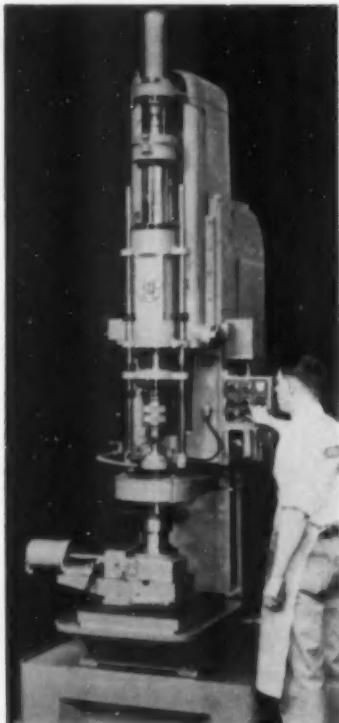
NEW EQUIPMENT



Spline Honing Machine

ONE adaptation of the model 728 Hydrohoner is used for spline honing, in which hardened gears are processed so the bearing surfaces of the splines are generated concentric with the pitch of the teeth.

Previous to the adoption of honing it had been necessary to anneal these surfaces before the final machining



In this operation, Model 728 processes forged steel, 58 to 60 Rockwell C hardness. It removes 0.002 to 0.006 in. of stock on diameter, holding out-of-roundness and taper to less than 0.0003 in. Finish is 15 to 20 microinches rms. Size is held so shafts can be fitted easily with 0.0002-in. minimum clearance. The model has cycle time of 35 to 40 seconds per gear, turns out 350 to 450 gears in an eight-hour shift.

operation. Result was soft bearing surfaces; character of the finish made it difficult to fit the shafts to the gears in 0.0002-in. increments because the soft surface tended to pick and gall the shaft.

Microhoning solved this problem

because surface hardness does not affect spline honing. Instead, the problem was to obtain proper tool actuation in the confined area. This is particularly significant because, unless heat-treatment is controlled very carefully, the hole may be out-of-round and tapered as much as 0.006 in. when it reaches the honing operation. To remove this amount of stock and correct inaccuracies, the cutting path of the abrasive grit must be varied and all stones dressed an equal amount.

In conventional honing jobs, this is accomplished by rotating the tool as it is reciprocated through the bore. To hone splines, tools are designed with a stone for each spline—the stone about half as wide as the spline. Rotation is replaced by an oscillating motion. The stone is swept across the spline as the tool is reciprocated. To get full surface coverage by all the stones, the part is indexed periodically during the honing cycle. *Micromatic Hone Corp.*

Circle 68 on postcard for more data

Pinion Chamfer

THE single-station model BM-2148 Burr-Master for chamfering hypoid pinions is said to produce more than 250 pinions per hour per machine, and one operator can handle two machines. The push-button actuated machining cycle is completely automatic with the machine coming to a stop with cutting tools retracted when the cut is completed. It eliminates all sharp corners well into the root of the tooth.

Pinions are inserted, shaft down, into the opening provided in the work station and the radial locator lever is actuated by the operator to make certain the part is radially located. This action energizes the clamping circuit and the part is then clamped by depressing a push-button. The machining cycle is started by means of two push-buttons, located on opposite sides of the machine for maximum operator safety. Machining time is five seconds and floor-to-floor time is 13 seconds.

An indicator light shows the start of the machining cycle and goes off

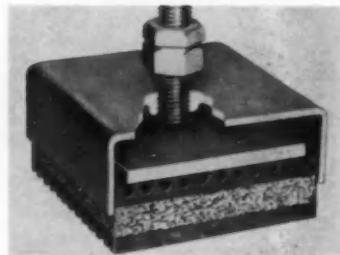
when the machine stops. A foot pedal is used to eject the finished parts.

Changing over from one pinion to another requires only removal and replacement of upper and lower toolholders, upper and lower cutters, work driver, locating fixture and a set of change gears. The fixtures are pre-located, doweled and keyed so that the fixture and toolholders can be dropped into place and locked in with set screws.

High speed steel cutting tools used are specially developed form tools of the dovetail type. When regrind is necessary, tools are reset without gaging merely by bringing them against a stop bearing on the tool face. Relief grinding is unnecessary. Cutting is dry, coolant is not required. Depth of cut is readily adjustable for the single cutting stroke to deburr and chamfer a tooth. Automatic indexing of the pinion takes place during the return stroke of the tools, permitting two cutting strokes per second. *Modern Industrial Engineering Co.*

Circle 69 on postcard for more data

Vibration Damper



No anchor or shims are required when machines are mounted on Lev-Elasto-Damper adjustable leveling mounts. All moving parts are visible, and resistant to the action of oil or chemicals. The isolating medium is cork bonded between layers of neoprene, grooved to prevent walking. *(Karfund Co.)*

Circle 70 on postcard for more data

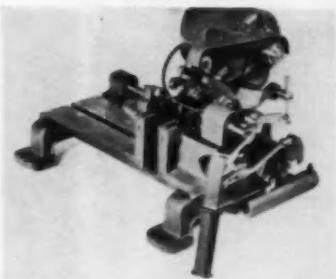
Ultrasonic Tester

THE Type UW Reflectoscope for contact or immersion nondestructive testing, checks for internal flaws in metals, in production. It operates on nine frequency ranges between 200 kc and 25 mc. Both aural and visual signals are provided. Two search units are included with up to 50-ft cables. The unit is capable of testing through as much as 125 ft of material, and finding defects as close as 0.05 in. from the surface. The findings are shown on a five-in. cathode ray tube. *Sperry Products, Inc.*

Circle 71 on postcard for more data

Centering Machine

THIS bench-mounted centering machine is reported to hold round workpiece concentricity to within 0.0003 in., and accurately maintain drill center depth tolerances of 0.002 in. It centers, drills, spot-faces, cham-



Bench centering machine with self-contained lubrication system, New Departure bearing on guides, and General Electric 1/3-hp motor.

fers and pin-points round work up to one in. in diameter, and of any length. It is said to eliminate distortion of ends, flaring, and minimize tool breakage since the work is rotated up to 15,000 rpm while the tool remains stationary. External diameter of the workpiece can be finished before centering or drilling the ends.

The new tool reportedly is capable of producing centers at the rate of 800 per hour. By operating a single, synchronized, cam-actuating lever, the workpiece is locked into position, tool is fed into workpiece, while a predetermined supply of lubrication oil is automatically fed to the tool. *Central Engineering Co.*

Circle 72 on postcard for more data

Handy Sealant

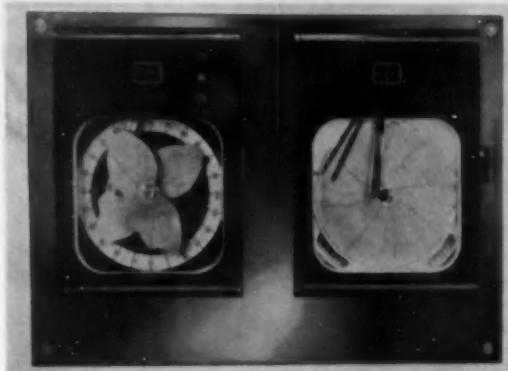
PLASTIC Lead Seal now is available in polyvinyl tube providing an easy and convenient method for applying the compound to threaded connections and other surfaces to eliminate waste or mess. The tube is made from tough polyvinyl plastic that will not crack at the seams or separate at the bottom crimp.

Plastic Lead Seal pipe thread compound is Underwriters' approved. It provides a permanent, leakproof seal under a wide variety of applications and service conditions—yet is non-hardening, thus permitting easy disassembly of connections, even after years of service. It withstands pressures up to 6000 psi, temperatures to 600 F, and is insoluble in water, steam, gas, refrigerants, many chemicals and all petroleum products. *Crane Packing Co.*

Circle 73 on postcard for more data

Time-Program and Cycle-Controller

Bristol program controller and cycle controller can be mounted side by side or vertically to suit space available.



A TWO-PEN, two-cam time-program controller with a cycle controller which times up to eight operations has just been announced. The time-program controller can be used to control two physical variables through any predetermined program by means of an aluminum cam. Each of two cams is individually cut, and locked together in any desired time relationship on a single hub. In this way, temperature can be controlled through one cycle of changing values while pressure is going through another cycle independently, but synchronized with the temperature. The two cams can be changed as a unit

in a matter of seconds, altering the program performed to meet varying requirements. Program controllers are available in on-off or proportional electric control, or pneumatic control in proportional, reset, or derivative modes.

At the same time, such operations as the opening and closing of valves, switches, and dampers, and the starting and stopping of motors, pumps, and blowers can be automatically timed by the cycle controller. This controller operates up to eight high capacity air valves or electric switches. *Bristol Co.*

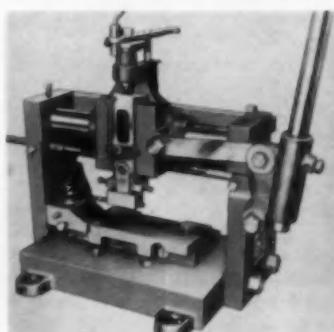
Circle 74 on postcard for more data

Metal Marker

A HAND-OPERATED marking machine has been introduced to impress inscriptions on cylindrical or flat workpieces up to about 3½ in. in diameter or thickness. Principle feature of the E.P.I. machine is said to

draws the carriage and marking die along a round slide bar. Length of inscription is about two in. on steel or three in. on brass. *Pryor Steel Stamps.*

Circle 75 on postcard for more data



Pryor model E.P.I. marking machine

be the ease of setting up with straight or segmented steel type, for a variety of work. Simple adjustments insure evenness of impression. A hand lever

Filter System

SELF cleaning industrial filters in a two-way system remove fine as well as coarse particles from liquids through a permanent filter medium. In the Delpark Up-Flo Filter, gravity removes the heavier solids before filtration of the liquid through a horizontal bar-type screen. Only the fine particles held in suspension reach the screen. Chain driven flights operating on a time lapse sequence pass under the filter and remove deposits from the underside of the screen and the area beneath the screen. These flights carry the particles to a device which cleans the flights. Filtered swarf drops into a tote box for disposal. Many sizes, flows and capacities are available. *Industrial Filtration Co.*

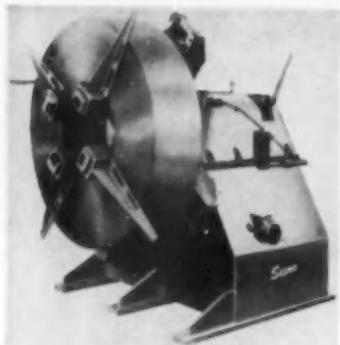
Circle 76 on postcard for more data

NEW EQUIPMENT



Coil Handler

HANDLING coils of steel with varying inside diameters is easily accomplished with the Sesco centering reel of five-ton capacity. Four arms accommodate center I.D.'s from 15 to



Sesco adjustable reel.

28 in. without adaptors. Keepers on the expansion arms are removable for loading by overhead crane. Expansion is power-operated, controlled by a hand lever.

The high-torque drive motor is reversible, with automatic braking. The unit does not require bolting to the floor. *Special Equipment & Sales Co.*

Circle 77 on postcard for more data

Square Gage Blocks

A SYSTEM of square gage blocks and accessories has been added to a line of gaging equipment which includes rectangular gage blocks and the Micro-Step Gaging System. The accessories extend the use of blocks to direct application in gaging and layout operations. They also fit any standard square blocks.

Tie rods with milled teeth assemble stacks of blocks. A base plate is provided on which to assemble up to four gaging assemblies. Flat jaws and round pins permit checking outside and inside diameters. Pins are held in V ways and can be rotated to allow for wear. Scribe and center point also are supplied.

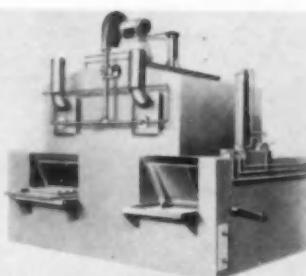
Dial indicators can be used to assemble "indicating square block gages," as a pin gage, comparator or

side gage for checking shoulders. The dial indicator can be precalibrated before assembly. *The DoAll Co.*

Circle 78 on postcard for more data

Small Furnace

A small batch furnace for controlled atmosphere heat treating is now being produced. Such cycles as carburizing; carbo-nitriding; clean, neutral bright hardening; normalizing; annealing; tempering and non-ferrous heat treating can be run at 400 to 1800 F. Capacity is 500 lb gross per hour at 1500 F. The floor-level unit is controlled by two valves. The heated stock is lowered by an



Holcroft batch furnace

elevator, transferred to quenching position and lowered into the oil. Simultaneously a tray of cold stock moves onto the charge elevator and into the furnace. The operator may remove quenched stock or load the furnace at any time during the heating cycle. *Holcroft and Co.*

Circle 79 on postcard for more data

Versatile Lift Truck

CLAIMED to have the compactness and maneuverability previously found only in fork lift trucks with considerably less capacity, the model 500 fork lift truck answers a definite need of many users for a more powerful, yet compact and maneuverable lift truck to handle loads up to 2½ tons.

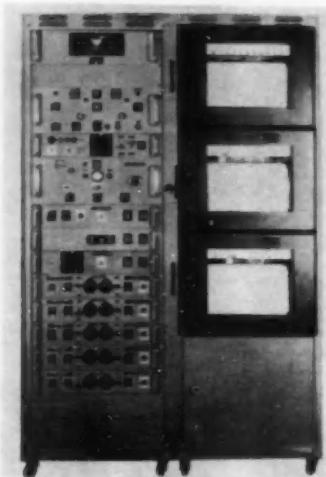
Available currently in both gasoline and Diesel powered models, this new truck is designed with a turning radius of only 81 in. and will operate smoothly in aisles 69 in. wide. *Towmotor Corp.*

Circle 80 on postcard for more data

Data Plotter

PLOTTOMAT is the name of a device that automatically plots and integrates values of any combination of parameters.

Use of this equipment reduces the time needed to compile data. It is said to be readily adapted to existing



The Pratt & Whitney Aircraft Div. uses the Plottomat to speed data recording on experimental turbine test rigs.

card punch systems, or the data may be fed into IBM or Univac calculators. If desired, the information may also be read visually. Data compilation and computation are speeded up even more when card punch accessories are actuated. Automatic test programming, and provision for constant plotting rate under maximum speed of obtaining data, are possible applications. *Allied Engineering Div.*

Circle 81 on postcard for more data

Polishers

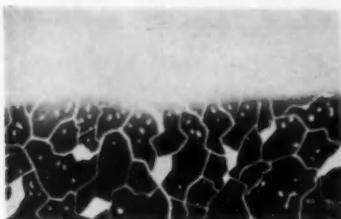
TWO new tools, a heavy-duty automatic polisher, and a heavy-duty polisher, plus improved Vitri-Glaze, have been introduced. They possess 60 per cent more power than previous models, yet their weight has been reduced five per cent. A new type centrifugal fan increases the amount of air passing over the commutator. A redesigned handle provides for more comfortable operation. With the automatic polisher, thumb pressure on the pump handle causes Vitri-Glaze to feed from a reservoir through a brass tube, and down through the hollow spindle so that it is sprayed on the surface to be polished. *Black & Decker Mfg. Co.*

Circle 82 on postcard for more data

Materials and Processes: Chrome, Plastic, Dye, Bonder

Surface Chrome Process

Chromium can be diffused into ferrous metals and form a stainless surface alloy to depths from 0.001 to 0.008 in. and more without causing dimensional changes. The process will permit ferrous metals to resist



spreading. They are flexible enough to permit coating sheet metal before forming. The material, in two viscosities, consists of 1-20 micron particles of fluorocarbon polymer in volatile organic liquids, supplied at 40 per cent solids. Each coat fuses to a film of 0.002-0.0025 in. thickness. About five coats are normally used.

M. W. Kellogg Co.

Circle 85 on postcard for more data

corrosion, thermal oxidation even at temperatures to 1700 F, and resist wear and abrasion under a wide variety of difficult applications. According to the supplier, the surface will not chip, crack, peel or gall even when the processed product is bent 180 deg, stretched or twisted. Products can be welded before or after processing, the mild steel procedures being used before processing, the stainless steel welding procedures being used after processing. In addition, they can be brazed, arc welded and spot welded. In spot welding, after treatment, the mild steel procedures are still used. Specification gray iron and malleable iron castings and meehanite can be treated to make castings with corrosion resistance properties. *Alloy Surfaces Co.*

Circle 83 on postcard for more data

Sealer for Castings

Porlox Seal is a metal oxide type sealer featuring short reaction time. The sodium silicate vehicle carrying minerals and oxides, catalytic oxidizing agent and rust inhibitor, is said to eliminate porosity in ferrous and non-ferrous castings and welded joints. Three grades contain various sizes and quantity of oxide particles. Impregnation time at 180 F under pressure is 20 minutes for the batch method. Internal impregnation by sealing all openings in the casting requires only 30 seconds. *Prencos Products, Inc.*

Circle 84 on postcard for more data

High-Temperature Coating

A plastic coating for equipment operating at high temperatures and corrosive conditions, KEL-F dispersions are applied by spray, dip or by

Flux for Silver Brazing

Type B-1 flux for silver alloy brazing of stainless, chromium heat resisting alloys, chromium and tungsten carbides is designed to reduce oxides of the refractory metals while protecting the underlying metal from further oxidation during brazing.

It is claimed to withstand heating at 1400-1600 F for short times and to increase its life at lower brazing temperatures. A strong deoxidizer and one whose oxide is a flux former allows the flux to regenerate itself during the heating cycle. After brazing, the flux can be removed readily with hot water. Among important applications are its use with AMS 4772 brazing alloy, flow point 1515 F, for brazing jet engine compressor blades, and for the attachment of chromium carbide and tungsten carbide tool tips. *Handy & Harman.*

Circle 86 on postcard for more data

Handy Dye Penetrant

Inspection by dye penetrant is simplified with a kit of pressurized cans. The Spotcheck kit contains penetrant, developer and cleaner to detect surface cracks in any mechanical part. *Magnaflux Corp.*

Circle 87 on postcard for more data

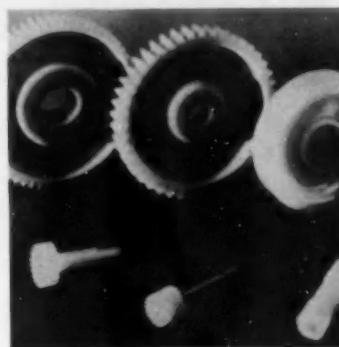
Non-Woven Filler Material

Any cardable textile fiber can be used as the base for non-woven All-Fab material with a resin binder. As a filler for vinyl coated material, it features "loft" and ease of electronic stitching. Other uses are listed as including: spacer, seal, bumper, wick, weatherproof and wiping material. Texture varies from fluffy to dense depending on binder content of five to 75 per cent. Initial production will be in thicknesses of 1/16 to two in., 50 to 80 in. wide. *The Felters Co.*

Circle 88 on postcard for more data

Molding Nylon

Nylon molding and laminating compound is in large scale production as this firm enters the thermoplastic



field. Known commercially as nylon 6, it will be trademarked Plaskon Nylon 8200. *Barrett Div., Allied Chemical & Dye Corp.*

Circle 89 on postcard for more data

High-Temperature Adhesive

Two modified phenolic adhesives have been developed for high temperature and humidity applications. They will be placed on the market shortly under license by Rubber and Asbestos Corp. and American Latex Products Corp. Hi-Temp is used for bonding metals and reinforced plastics. CHT is used in fabricating sandwich type lamination of metals, plastics or woods having an inner core of aluminum foil or other light material. The adhesive in this case is applied only to the facing surfaces. *North American Aviation, Inc.*

Circle 90 on postcard for more data

Hammer Die Plastic

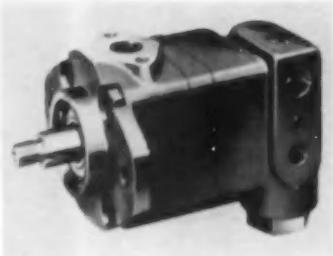
An impact-resistant plastic tooling compound suitable for drop hammer dies is known as a modified Epoxy. It is based on a combination of liquid epoxy resin and a polysulfide liquid polymer manufactured by Thiokol Chemical Corp. A drop hammer die body for forming an aluminum alloy part at the Douglas Aircraft Co. is constructed of Kirksite with a $\frac{1}{8}$ in. thick facing of the compound. Durometer hardness of the punching face is 80 to 95. The die face is unmodified and is considerably harder. *Furane Plastics Inc.*

Circle 91 on postcard for more data

NEW

PRODUCTS.

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89



Pump for Hydraulic Starting Systems

This flange-mounted oil-hydraulic pump is designed to recharge an accumulator system which provides oil-hydraulic power for cold starting of gasoline or Diesel engines in stationary, marine, or large mobile equipment. The Series VU-100 pump includes an integral unloading valve which opens at 2500 psi and closes at 2100-2150 psi. Designed for working

pressures up to 2500 psi and speeds up to 3600 rpm, the pump delivers 1.5 gpm at 2000 rpm and 2000 psi. It is driven by the engine directly or with a gear drive. The cover containing the accumulator connection ports is designed to permit assembly in any of four different positions. *Vickers, Inc.*

Circle 36 on postcard for more data



Cartridge Bearing Easily Installed

A self-contained cartridge roller bearing just announced consists of outer race, roller assembly, retaining disk and seal. It is designed to replace plain bushings, for caster and wheel housings, and in gear boxes or drives. Present sizes fit $\frac{1}{2}$ to $1\frac{1}{8}$ -in. shafts and $1\frac{1}{8}$ to $2\frac{1}{2}$ in. housing

bore. Type N has hardened but unground rollers for shafts of Rockwell C-54 minimum; type UN has either unhardened and unground or hardened and ground rollers. Roller sizes are interchangeable. *Rollway Bearing Co.*

Circle 37 on postcard for more data



Low-HP Converter

Gasoline engines or electric motors under 10 hp can be equipped with a fluid torque converter now on the market. Turbine, reaction member and pump are contained in an aluminum housing, and total weight is $27\frac{1}{2}$ lb. Maximum torque multiplication is said to be 2.8. *Little Beaver Industries, Inc.*

Circle 38 on postcard for more data

Valves for Tubeless Tires

To replace damaged tubeless tire valves, three replacement valves that match the current original equipment type have become available. No. 4337K3 standard clamp-in type Valve fits all wheels equipped with tubeless tires. Special large rubber washers are packed with each valve to permit attachment to rims with round or oval shaped rim holes. No. 54 rubber covered snap-in type is designed to form an airtight seal in $\frac{1}{8}$ in. round rim holes. No. 3640 is similar to No.



4337K3 but has one rubber washer.
A. Schrader's Son.

Circle 40 on postcard for more data

No-Sag Seat Pad

A seat pad has been developed which is said to prevent the cushioned section from sagging or cupping in the open spaces in the top surface of the seat cushion or seat back spring assembly. The Elast-O-Pad is continuous plastic lamination consisting of upper and lower sheeting of Visqueen polyethylene film, reinforced through the center with monofilament plastic extrusions at regular spaced intervals, the entire lamination being bonded by a permanent plastic adhesive. *Gordon-Chapman Co.*

Circle 39 on postcard for more data

Hydraulic Valve

Model 23 on-off valve is a positive locking, push-pull type for industrial vehicles. Capacity is eight to 10 gpm at 1000 psi. Manually operated, it is said to be adaptable to remote control and mounting in any position. It features dust and moisture seals. *Wisconsin Hydraulics, Inc.*

Circle 41 on postcard for more data

Free INFORMATION SERVICE

Use either of these postcards for Free Literature listed below, or for more information on New Production Equipment and New Products described in this issue.

USE THIS POSTCARD

FREE LITERATURE

Pipe Plugs 1

"Dry Seal" pipe plugs, $\frac{1}{8}$ to two-in. diameter, are specified and prices given in a 10-page catalog. Materials include steel, 430 and 1618 stainless steel, silicon and commercial bronze, aluminum, carbon steel and cast iron. Various finishes are available. *Elco Tool and Screw Corp.*

Hardening Steel 2

"The Present Status of Austempering and Martempering" is an informative semi-technical summary of the factors to consider in heat treating by these methods. *Ajax Electric Co.*

Aero Electricity 3

Its facilities for developing, producing and testing airborne electrical systems are portrayed in a 31-page booklet, B-6392, published by *Westinghouse Electric Corp.*

Parts Makers 4

Forging, cold heading and machining facilities for making bolts, control rods, spring clips and other parts are outlined in a picture brochure offered by *Columbus Bolt & Forging Co.*

Valve Line 5

Publication of a new general catalog of solenoid-operated valves has been announced. It covers five basic valves of which there are thousands of variations. It includes data on how to choose the correct valve for various applications. *Skinner Electric Valve Div.*

Hydraulics 6

Detail perspective and sectional views of hydraulic components for machines are featured in a brochure available from *John S. Barnes Corp.*

Aircraft Drills 7

High speed extension drills 6 and 12 in. long, and threaded shank drills in several sizes and threads are illustrated in a pamphlet from *Whitman & Barnes*.

Surface Grinder 8

Fourteen models of type CX heavy duty surface grinder are illustrated and specified in a six-page brochure. *Thompson Grinder Co.*

Alloy Data 9

"Nickel-Copper High Strength Low Alloy Steels" is a 48-page booklet illustrating the wide application of these steels in transportation, agriculture, marine equipment and other fields. Working methods, mechanical properties, compositions and availability of seven steels of this class are given. *The International Nickel Co., Inc.*

Double Pump 10

A series of 2000-psi variable delivery hydraulic power units as double pumps equipped with integral valve panels are described in bulletin DP-308. *Dudco Div., New York Air Brake Co.*

(Please turn page)

5/1/55

VOID After July 1, 1955
Circle code numbers below for Free Literature, New Plant Equipment
or New Product Information

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41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
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VOID After July 1, 1955

5/1/55

Gear Manual**11**

An engineering manual, DR No. 2, on the complete line of Duti-Rated Lifetime Gearing, lists all standard gear sets available by center distance and capacity. In addition to illustrating and listing the line, with complete specifications, the book contains material helpful in the selection of proper gear sets. *Foote Bros. Gear and Machine Corp.*

Air Cylinders**12**

A bulletin describing over 1900 mounting size and control combinations of standard air cylinders with a built-in valve is available to designers or users of machines with automatic or semi-automatic motions. *Carter Controls, Inc.*

Broach Catalog**13**

Revised catalog No. 450 describes the firm's line of broaches and machines and gives some information and examples of broach design and applications. *American Broach & Machine Co.*

Threads Data**14**

A 24-page Engineering Data Section for their catalog of standard and special hexagon nuts covers the proper installation of their product, including a guide chart for calculating wrench torques. *National Machine Products Co.*

Degreasing**15**

Vapor degreasing, its advantages and the latest equipment available, are pictured in bulletin No. 953-1. *Romeo Equipment Corp.*

Plating**16**

Electroplating and polishing equipment and supplies, 261 products under 63 different classifications, as well as 17 plating and cleaning processes and their applications, are listed with a description of ten technical, laboratory, training, and research services. Bulletin PP-100. *Hanson-Van Winkle-Munning Co.*

**Cast Alloy Tools****17**

A variety of cast alloy cutting tools, including square and round bits, solid cutoff blades, tipped bits, inserts, and inserted-tooth milling, boring, and reaming blades are shown in catalog 55, available from *Crobolt, Inc.*

Screw Feeder**18**

An automatic screw feeding system picks up several hours' supply and positions screws in an elevator which feeds them to a magazine track and aligns with the screw feed tube. Compressed air feeds one at a time to delivery head for attachment to any standard driver. Data sheet available. *Pneuma-Serve, Inc.*

Floor Trucks**19**

A line of platform trucks, two-wheel hand trucks and various other types for industrial and commercial use are illustrated in a 64-page catalog, No. 100, available from *Hamilton Caster & Mfg. Co.*

Washing Machinery**20**

Sixty-six types of washing, pickling, drying, phosphatizing, degreasing, and tempering machines and accessories are presented and specified in a new catalog. *Metalwash Machinery Corp.*

Band Machines**21**

Machines that saw, file, polish and grind and feature hydraulically powered tables and controls are described in a recent 20-page catalog. *The DoALL Co.*

Solvent**22**

Information on Chlorothene (Dow Inhibited 1,1,1-Trichloroethane), a new cold degreasing solvent, has been compiled in a pamphlet which is now available from *Dow Chemical Co.*

Iron Phosphating

The process by which iron phosphate coatings improve paint adherence and prevent corrosion on steel is explained and diagrammed in a 12-page booklet recently published. Write on company letterheads to *Oakite Products, Inc., 128A Rector St., New York 6, N. Y.*

(Turn to page 127, please)

Yes Leaded Steels Can Be Forged

This is our answer based on experience with many producers of forgings who have used leaded steels. Ledloy* and leaded alloy steels can be heated and forged in exactly the same manner as comparable standard steels.

No modifications in forging practices have been necessary is the report from users of leaded steels.

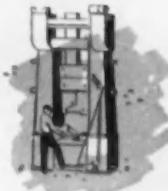
Leaded alloy steels and leaded carbon steels for forging are available in all standard or S. A. E. compositions and in any of our standard sections. Write today for complete information about application of leaded steels to your forged product.

*Inland Ledloy License



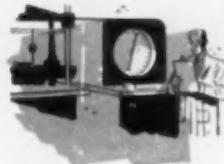
Are leaded steel forgings readily machinable?

Yes, the use of leaded steel forgings will result in the same improved machinability as is obtained in leaded steel bars.



Loss of lead due to heating?

Investigation has shown that the exudation of lead upon heating leaded steels is confined primarily to the scale. The lead content in the forging proper remains virtually intact.



Does lead affect mechanical properties?

No, the addition of lead does not materially affect the mechanical properties of forging.



Is there a health hazard?

Not generally. With ventilation normally required in forge shops, the use of leaded steels does not present a hazard.

COPPERWELD STEEL COMPANY • STEEL DIVISION • WARREN, OHIO DISTRICT OFFICES



P. O. Box 1633 Tulsa, Oklahoma	80 King Street West Toronto, Ontario, Canada	1578 Union Commerce Bldg. Cleveland, Ohio	143 Washington Avenue Albany, New York
315 Hollenbeck Street Rochester, New York	Monadnock Building San Francisco 5, Calif.	176 W. Adams Street Chicago, Illinois	611 Beury Building Philadelphia 40, Penna.
117 Liberty Street New York, New York	325 W. 17th Street Los Angeles 15, Calif.	1807 Elmwood Avenue Buffalo, New York	625 James Street Syracuse, New York
711 Prudential Building Houston 25, Texas	First National Bank Bldg. Jamestown, New York	7251 General Motors Bldg. Detroit, Michigan	3102 Smith Tower Seattle, Washington

For export—Copperweld Steel International Company, 117 Liberty Street, New York

NEW



AIRCRAFT PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

Servo Valve

The FC-2 flow control valve controls hydraulic flow proportionally to an input current signal. It is a two stage, four way valve. Its pilot stage is a hydraulic amplifier of the nozzle type driven by a torque motor employing the polarized relay principle. A miniature high force, positional feedback



loop between the torque motor and the main spool position encloses the nozzle stage, for good characteristics over wide ranges of supply pressures and ambient temperatures. The torque motor, of balanced coil resistance construction, is supplied in ranges of 200 to 3000 ohms dc resistance per coil. Signal levels as low as six ma differential current produce full valve flow when using the 3000 ohm coils. Supply pressures of from 500 to 3000 psi may be employed. When operating in a 3000 psi system, a typical valve can deliver to the load a peak power of 10 hp.

The principal application of the valve, is in servo loops where high dynamic performance at high force levels is required. Most recently, it has been accepted for use on inhabited aircraft for flight stabilization where an additional requirement has been its ability to operate satisfactorily in ambients of 250 F. Cadillac Gage Co.

Circle 46 on postcard for more data

Small Hinge

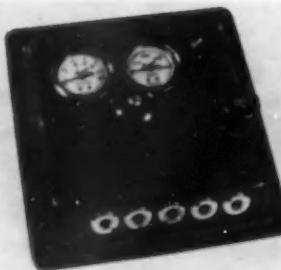
Type H84 and H85 hinges of 302 stainless steel or 24-ST aluminum

alloy will attach small access doors or covers without any skin cutout. They require less than $\frac{1}{2}$ in. depth dimension below the skin surface for clearance. Fastened by rivets or spot-welding, they are completely hidden from the exterior. Hartwell Aviation Supply Co.

Circle 47 on postcard for more data

Oxygen System

An oxygen console is designed to supply low-cost oxygen for business aircraft. The unit measures $7\frac{1}{2}$ by 8 by 1 $\frac{1}{2}$ in. and includes the high-pressure on-off valve, the regulator and five mask outlets. The console may be attached anywhere in the cabin. The



oxygen supply cylinder is mounted in the baggage compartment with two quick-disconnect brackets. This simple installation is completed by joining the console panel with the supply cylinder with a length of stainless steel, high-pressure tubing. The regulator is set for the cruising altitude. Masks are plugged into the outlets which are automatic on-off valves. Scott Aviation Corp.

Circle 48 on postcard for more data

Sealed Switch

Development of a new completely-sealed subminiature snap-action switch is announced. Designated ISEI it gives trouble-free operation in temperatures ranging from -65 F to 180 F. Complete sealing is accomplished with a silicone rubber plunger

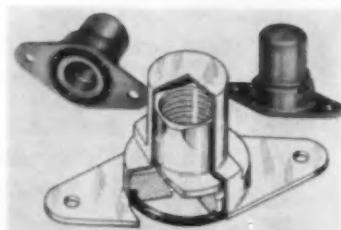
seal, bonded both to the pin plunger and the metal housing, and by embedment in an epoxy casting resin inside the housing. The exterior housing is corrosion-resistant treated aluminum. Tentative electrical rating is: 30 v d-c, 2.5 amp inductive, 4 amp resistive; maximum inrush is 15 amp. Micro Switch, Div. of Minneapolis-Honeywell Regulator Co.

Circle 49 on postcard for more data

Sealing Nut

A self-sealing anchor nut has been designed to prevent liquid leakage in wetwing aircraft fuel stowage. Type A2500 cap seal floating anchor nut provides a positive seal against leakage up to 50 psi on either side of the sealing element, regardless of vibration, strain, or temperature changes.

An all-metal self-locking nut body is enclosed by a one-piece aluminum cap with a sealing ring in the base. The nut body is designed with a floating action of 0.025 in. in all directions. The parts meet AN-N-5 specifications



for operation between -80 and +250 F. The seal is effective whether the bolt is installed or not. It is not affected by repeated bolt installations.

The "O" ring meets all requirements of MIL-R-6855 and is resistant to gasoline, salt water, and aromatic jet fuels. No additional sealing compound is required. These sealing rings are of standard design and can be ordered separately from the nut to assure freshly-molded material. Elastic Stop Nut Co. of America.

Circle 50 on postcard for more data

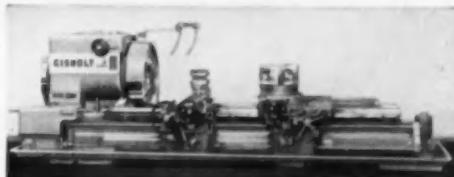


**"Here's why GISHOLT insists upon
the HEAVIEST CASTINGS!"**

Look at them... castings for the heaviest saddle type turret lathes in the business! Look at all the angles:

First, note how the headstock is cast integrally with the bed for perfect spindle alignment... how cross supports give the most solid base for carriages, tools and slides... how extra-heavy webbing gives the headstock the ruggedness to support powerful gear train members.

Remember, too, that cast iron absorbs vibration. The heavier the better! And Gisholt controls the quality of the finest nickel semi-steel in its own foundry.



The Gisholt 5L Saddle Type Turret Lathe has a net weight of 22,500 lb. without equipment.

What does it mean to you? You can load up your Gishols with carbides and really turn out the chips! You've got the strength, the rigidity and the freedom from vibration to take all the speed you can get from today's carbides—with the heaviest feeds—and still have the safety margin to take care of tomorrow's tool bit developments.

GISHOLT
MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.



TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Observations

By Joseph Geschelin

Industrial Designer

Henry Dreyfuss, noted designer, has scored another brilliant mark. TWA in recent releases credits him with the design and styling of the interiors of its new fleet of Super-G Constellations. We hope to be able to ride one of these new ships one of these days.

The GAW

We have been reading a lot about the guaranteed annual wage recently. And we have some ideas of our own on the subject. However, we were impressed with some statements made recently by a student of labor affairs. His thesis is that GAW may become definitely a device for creating unemployment; and he cites the situation in Italy where GAW is national law. Because anyone added to the payroll automatically owns his job and must be guaranteed his wage thereafter, employers prefer to pay overtime to the existing labor force rather than add to it. Even if a new contract is in the offing, the employer hesitates to add to his rolls since he becomes responsible for the new workers when the contract runs out. So delivery on new business suffers. This is something that merits considerable thought.

Research Unlimited

The annual report of the Stanford Research Institute becomes more interesting with the passage of time. Among the many projects investigated during the past year we give you a sampling: the rocket problem, checking a theory that detonation might be suppressed or caused farther down the tube, proved that use of a porous liner of bronze pushed the detonation zone downward between 20 and 25 in.; development of a non-destructive test device—the Stub Meter—for checking the quality of plastic-bonded sandwich materials; matching the computer to the unique

data problem—assisting the user in specifying the kind of computer required, and aiding him in seeking the sources that make such equipment. The list of projects is almost endless.

Magnesium Fixturing

Recent issue of *Magnesium Topics* (Dow Chemical) draws attention to the use of magnesium alloys for jigs and fixtures. It points out that maximum economy can be gained from the use of magnesium rolled plate and extrusions because of lower price, increased availability, and excellent physical properties. With the completion of rolling and extrusion facilities at Dow's Madison Division, automotive users now are assured of an adequate supply suitable for most tooling purposes.

Forging Titanium

What is claimed to be the world's largest installation of non-ferrous forging equipment at Alcoa's Cleveland plant is being expanded in scope by equipment that will permit acceleration of facilities for forging titanium.

Parts Makers

General Motors annual report issued recently had one bit of information of interest to us and many others. It stated that GM now has an amazing total of 21,000 prime contractors supplying the various divisions with two parts and materials used in the GM line of products. The total is certainly larger than we could have estimated, and shows that suppliers still represent the sinews of the automotive industries.

Underpass Drainage

Synchro-Start Products comments on another unique stand-by installation in which a gasoline engine operates on an automatically initiated

cycle through application of Synchro-Start controls. Here is a case of an automatic engine driven pump installed to solve a serious problem of draining a highway underpass in Texas. Flooding of the underpass was a common occurrence during periods of heavy rains, tying up traffic completely. The engine driven pump now takes over upon actuation from a float mechanism. The float mechanism triggers the automatic control on the engine, thus actuating the engine starter. If the engine fails to start, the starter is caused to make four attempts of 15 seconds each with five second intervals between attempts.

Cast Cranks

As we commented recently, cast crankshafts appear to be very much in the cards for 1956 engines. At the present writing there are a number of special techniques available for this purpose. Shell molding is employed by several major foundries—one using nodular cast iron; another, pearlitic malleable. Auseo, currently making cranks for Packard and Reo V-8's, is staying with stack molding at the present time. These techniques provide a wide latitude for designing engineers.

'57 Year of Decision

If what we hear about the possibility of adopting 14-in. wheels by 1957 is true, then '57 may be the year of decision insofar as passenger car brakes are concerned. That is the year that may see the adoption of disk brakes.

Exhaust Power

Based upon recent work by DeLaval, we expect an announcement of a new type of turbocharger for heavy duty engines. Fantastic as it may sound, we are assured that current experimental work indicates the possibility
(Turn to page 136, please)



other leading engine manufacturers

selects and distributes...for

authorized replacement service...



Perfect Circle

2 in 1 chrome piston rings...the

standard of comparison!



METALS

*Inventory Building Is a Factor in High Output of Steel.
Excellent Demand for Aluminum, But No Increase in Price*

By W. F. Boericke

Steel Output at Seasonal Peak

Steel production in March was nearly 10 million tons. Estimates for April indicate that steel demand was even higher and reached its seasonal peak during the month. Mills have been hard put to maintain delivery promises, according to *The Iron Age*. There may be some relief in the summer months, but it is not likely to be great. Demand is so broad that when one consuming group becomes less insistent, another takes up the slack.

Consumers want to get their orders on the books and get delivery from the mills with all speed possible. An important indication of the strength of the market has been the increase in the number of broken delivery promises. Some orders are running 30 days behind schedule. Customers have been asked by several mills to defer delivery on some items in tight supply.

The first quarter of the year ran about 27 million tons of ingot steel, and the second quarter should do as well. By the middle of April the industry was running about 95 per cent capacity. Probably all of the industry's efficient facilities were being used.

While the automobile industry has spearheaded steel demand, construction is expanding again, with especial emphasis on standard structural shapes. Demand for line pipe is good and is expected to improve further. March was the best month for tool steel since 1952. European steel business is booming and demand is heavy for semi-finished steel. Not all of the export business is being accepted by the mills, because of the possibility they will be unable to satisfy domestic requirements later on.

There are a few places where demand is less insistent. Steel buying is spotty by appliance manufacturers and some cutbacks in orders have been noted. But these are exceptional. In general demand is so strong that big steel users who usually place their orders direct with the mills have had to turn to warehouses for emergency supplies. Conversion deals have been broadened because of delivery delays by the mills.

Inventory Building Noticed

No doubt some of the heavy buying has been caused by inventory rebuilding. There is general belief that steel prices will go up this summer if the CIO United Steelworkers win a wage increase as is generally expected. The rule-of-thumb in the steel industry is

that an increase of one cent an hour in wage rates means a 40¢ increase in price of ingot steel, hence, a 10¢ wage hike would mean the price of steel would go up \$4 per ton. Steel customers are philosophically accepting the possibility of such an advance, feeling sure that producers will refuse to absorb the increase without price relief.

In anticipation of such an advance, many consumers justifiably feel that increasing inventories at this time is like having money in the bank. There are no valid estimates of how much steel has gone into inventory rebuilding, but it may have been more substantial than suspected.

Most steel executives expect there will be a moderate decline in rate of operations in the third quarter in contrast with the hectic pace of the first half of the year. This will be followed by a strong revival in the fourth quarter. However, it seems significant that producers are being asked to accept a substantial amount of business for the third quarter and at least one influential steel executive has stated that capacity operations can be maintained for the next six months.

Strong Demand for Aluminum

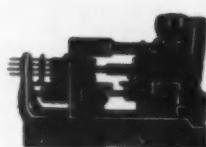
Demand continues strong for aluminum. Without much doubt the price could be raised by producers and meet little resistance from consumers, but this would be contrary to an established policy which favors steady expansion in use by maintenance of a stabilized price.

Last year aluminum was being stockpiled by Washington. This year a decrease of 75,000 tons for the first half of the year has been scheduled. Producers can take advantage of the "put" clause to take care of surplus metal, but there has been none thus far in 1955. The Government will release the producers from their obligations to deliver this metal in the first half of the year. The Defense Mobilizer noted that the supply of aluminum is insufficient to meet the immediate demands of the industrial economy and said that the shortage had resulted in serious industrial dislocation.

Secondary aluminum prices continue high, although there has been some easing in Eastern centers. Users don't expect much help from the Government's reduction in its take for the stockpile. Quite possibly another request will be made to divert 50,000 tons more to relieve industrial needs. Unlike copper, aluminum does not have to be replaced in the stockpile at a later date.

(Turn to page 128, please)

with the addition of



NEW 5/8" RA-8

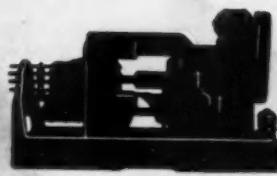
4 New Models



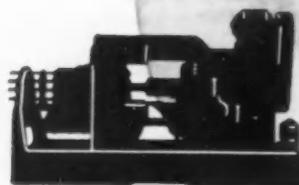
NEW 1 1/4" RB-8



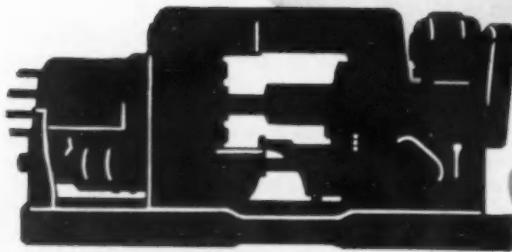
1 5/8" RB-8



2 5/8" RB-8



NEW 3 1/2" RB-8



NEW 4" RB-8

Acme-Gridley 8-spindle advantages now extend to ALL ranges of bar work up to 4" diameters

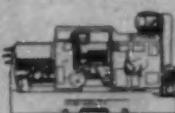
The principal performance advantages of Acme-Gridley 8-spindle bar automatics now can profitably be applied to bar work as small as the capacity range of a $\frac{5}{8}$ " machine and as large as 4" diameter. These advantages include:

- faster machining cycle time because of additional end working positions;
- "new machine" reliability longer—with carbide or high speed tooling;
- greater accuracy and uniformity of parts with fewer rejects;
- completion of a greater number of secondary operations in the primary machine setup (spindle stopping mechanism optional), with consequent savings in man hours, floor space and machine investment.

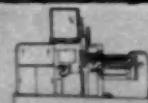
And for help-when-you-need-it, these new models (and all Acme-Gridleys) are backed up by a wealth of "complete line" tooling experience (literally thousands of tooling setups) plus a policy for service which has always played a mighty prominent part in maintaining National Acme's position of leadership.

It will pay you to plan your production the modern Acme-Gridley 8-spindle way. Why not ask us to tell you more about it?

SEE US AT THE MACHINE TOOL SHOW • SEPTEMBER 6 TO 17 • BOOTH NUMBERS 324 AND 708



OUR JOB: to provide the *Right Machine for YOUR JOB*



Acme-Gridley 4, 6 and 8 Spindle Automatic Bar and Chucking Machines • Fully Automatic Turret Lathes (Bar and Chuck Type) • Hydraulic Thread Rolling Machines • Automatic Threading Tools • Switches • Solenoids • Contract Manufacturing.

**THE NATIONAL
ACME COMPANY**

173 EAST 131st STREET • CLEVELAND 8, OHIO



In Northrop's central control area, an operator is in touch with an outlying factory area by use of a TelAutograph telescriber. Kardex cards maintained by both the sender and receiver provide identical information at both ends, and eliminate the possibility of error.

tem, and the only source from which information is channeled, incoming or outgoing.

When the TelAutograph telescribers at Central Control receive information on movements of behind schedule items, the information is immediately transferred to the master records, indicating need for corrective action, and providing the means for status and progress reporting. For master records, Northrop uses a new type of visual shortage board. Post index wall holders and pockets (Kardex type) are maintained by both the sender and receiver of messages. Both place messages in the Kardex pockets, which provides identical information at both ends, and eliminates the possibility of error.

All shortage reports from the outlying areas which are received by Central Control are reconciled immediately by a special group in Central Control, which determines if the shortage actually exists within the plant, or merely within the reporting department.

Each of the eight TelAutograph machines in the Central Control area are assigned to a minimum number of key spots throughout the plant. TelAutograph installations are located in tool control, the machine shop, fabrication release, fabrication control, spar assembly, electrical, paint shop, hydraulic section, bench assembly, spot weld, engine door section, empennage assembly, wing assembly, stub wing section, side panel section, sew up section, materiel review, electromechanical laboratory, engineering coordination section, weld shop, plastic section, engine shop, the flight line, central shipping, and at materiel and other points.

Northrop coordinators and project men are assigned to Central Control, where they can take immediate corrective action on any item reported. This item is expedited by the individual assigned to a given section of the airplane, from its point of origin until it ceases to contribute to a behind-schedule condition.

Through use of the rapid intercommunication procedures afforded by the TelAutograph system, Northrop anticipates it will save as much as \$175,000 annually.

TELESCRIBER SYSTEM

Reduces Delays in Aircraft Plant

FACTORY "trouble" or shortage conditions that could cause schedule delays on the USAF-Northrop Scorpion F-89D production line can now be reported instantaneously through use of a new TelAutograph telescriber system installed at Northrop's Hawthorne plant by the company's manufacturing control department. Northrop is believed to be the first aircraft company to adapt the system to the critical task of maintaining constant check on shortages that might effect schedule delays.

TelAutograph transceivers (sending station and receiver) have been installed at 37 outlying areas to transmit to eight receivers located in a Central Control area. The system at Northrop is designed for 60 machines, and additional ones will later be installed.

The TelAutograph system eliminates the use of telephone service for reporting any problems which could cause delays. All information is transmitted directly to Central Control, where personnel immediately take the necessary steps to rectify the problems or delays. Central Control is the "heart" of the sys-



1953

STERLING introduced a new, amazing piston

1954

ONE car manufacturer selected the new piston

1955

7 Manufacturers specify STERLING CONFORMATIC* PISTONS

In 1956 . . . there will be more! This quick acceptance by automotive engineers is a result of the demonstrable superiority of Sterling Conformatic Pistons. Sterling Engineers will be glad to show you how Conformatic Pistons can improve your engine's performance. Conformatic eliminates cold slap, scuffing and frictional power losses . . . because it conforms exactly to the cylinder walls over the entire operating range. Your Sterling Engineer can give you complete details and arrange a test.

Now LOW-COST

RING LAND PROTECTION

in Sterling CONFORMATIC Pistons

Ring grooves lined with lightweight intra-cast steel inserts give Sterling Conformatic Pistons even longer life . . . greater efficiency. An optional feature for truck and passenger car pistons.

STERLING ALUMINUM PRODUCTS INC.
ST. LOUIS, MISSOURI

*TRADE NAME REGISTERED



News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 39

Car Makers Will Aid Union In Collecting Higher Dues

Due to provisions in their contracts with the UAW-CIO, car manufacturers ironically have to help the union build a \$25 million fund which would be used against them should a strike develop over new contracts. While not pleased over the situation, car makers indicated they would go along with the union in collecting higher dues starting this month (May). Most workers have authorized the deductions, which have been increased from \$2.50 a month to \$7.50.

The union dues will remain at \$7.50 until the \$25 million figure is reached, whereupon they will drop back to \$2.50. Under the union's plans, the dues would fluctuate from then on. For example, whenever the fund falls to \$20 million, dues would be jacked up to \$3.50 a month to bring the total fund back to \$25 million. After the fund is built up to that figure, dues would decrease to \$2.50 again.

Chilton Trade Book Dept. To Publish Heldt Volumes

The Trade Book Dept. of Chilton Co. has announced that four classic books on automotive engineering, written and formerly published by P. M. Heldt, will be published by

Chilton as part of its regular line effective immediately. The four titles are: *High Speed Combustion Engines*; *High Speed Diesel Engines*; *Torque Converters or Transmissions*; and *The Automotive Chassis*.

These standard reference works are published in Spanish, French, German, and Italian editions, and are sold in every country in the world. They have been adopted by 24 colleges and universities, as well as by many trade and technical schools.

Retired engineering editor of *Horseless Age* and *AUTOMOTIVE INDUSTRIES*, Mr. Heldt was born in Germany and came to this country in 1890. Early this year he was awarded a plaque honoring SAE pioneer members.

Four-Unit Locomotive Is Built And Tested by General Electric

A new four-unit Diesel-electric, 6000-hp road locomotive has been produced by the General Electric Co. It has been placed in operation to evaluate components used in locomotives for export service.

To achieve this end, two of the four units are powered by eight-cylinder, V-type Cooper-Bessemer turbine supercharged engines. These four-cycle units develop 1200-hp each for traction at 1000 rpm.

The other two units are powered by 12-cylinder engines of the same make that develop 1800-hp each. The four units have a total weight of 490 tons.

New RCA Radio Tested By Car Manufacturers

At least one automobile manufacturer is testing a new type of radio developed by Radio Corp. of America for possible use on 1956 models. The new radio, which has nine transistors in place of electron tubes, operates directly from a six-volt battery, although it is also adaptable to 12-volt systems. It is said to require no vibrator, power transformer, or rectifier.

Chevrolet Claims Trend Toward Smaller Cabs

Preference for shorter wheelbase taxicabs is claimed in a report from Chevrolet, which shows that the division made noticeable gains in sales of these vehicles in New York City in the past year. Heavier models previously used by cab companies have been losing sales ground since the city ordinance was changed to permit shorter wheelbases in "for-hire" cars. Flexibility in performance and economy are cited as the two main reasons for the trend toward smaller cabs.

Basically, cabs are built and engineered along the line of passenger cars, but certain parts are made sturdier than those on the standard automobile to withstand rugged service. The Chevrolet taxicab, for example, has a heavy-duty clutch and heavier front suspension, shock absorbers, rear springs, and seat springs.

(Turn to page 102, please)

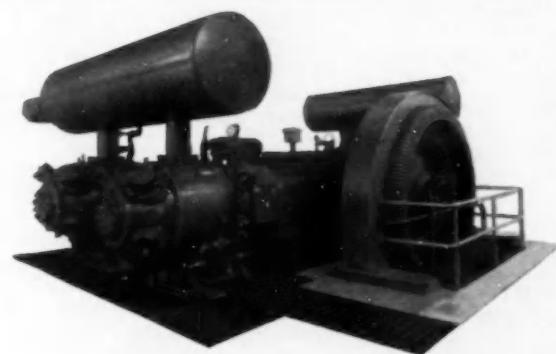
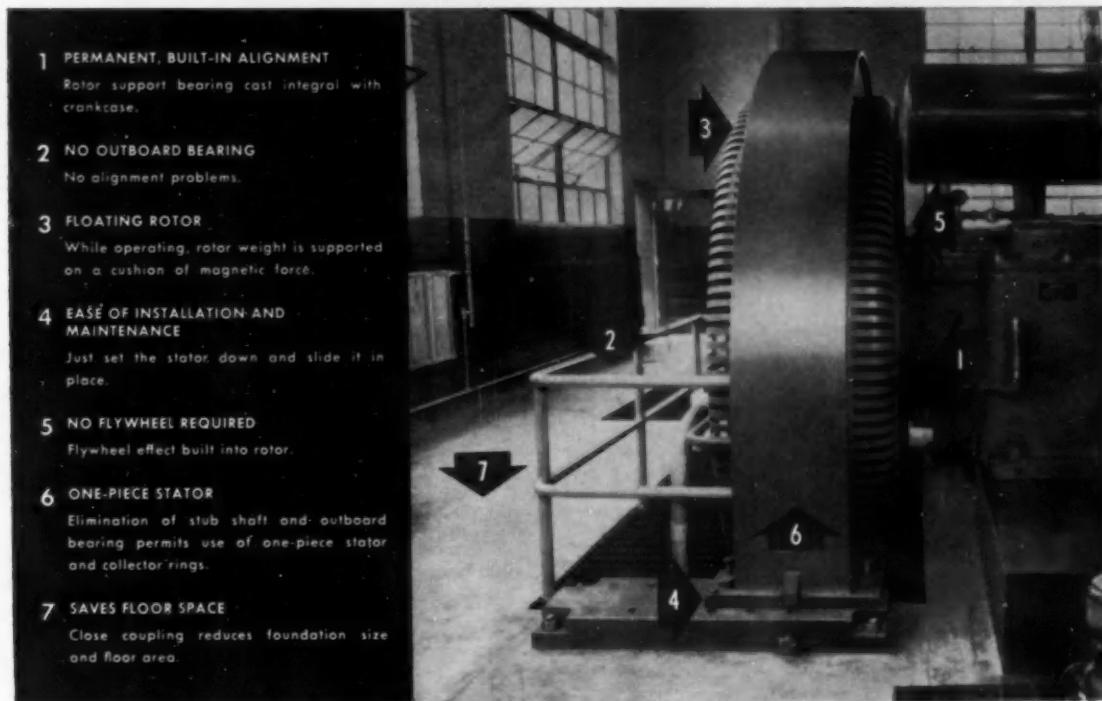
EVERY AREA OF COUNTRY SHOWS PERCENTAGE GAINS IN TWO MONTHS OVER 1954 Regional Sales of New Passenger Cars

Zone	Region	February 1955	January 1955	February 1955	January 1955	Two Months		Per Cent Change		
						Feb. over January	Feb. over Feb. 1954	1955 over 1954		
1	New England	24,352	25,571	26,914	49,865	37,879	-4.77	+21.67	+72.72	
2	Middle Atlantic	81,371	79,869	73,144	167,279	134,756	+1.77	+11.25	+20.22	
3	South Atlantic	63,691	61,342	44,546	124,982	80,118	+3.03	+42.98	+36.66	
4	East North Central	124,907	109,911	94,543	234,632	186,983	+13.64	+32.12	+29.54	
5	East South Central	24,679	21,865	19,238	46,656	36,294	+12.25	+28.28	+28.58	
6	West North Central	42,303	41,019	33,361	63,269	63,812	+3.14	+28.81	+30.49	
7	West South Central	44,190	36,915	36,610	61,126	72,644	+10.71	+20.70	+11.37	
8	Mountain	13,954	12,183	10,799	26,165	21,322	+14.44	+29.70	+22.71	
9	Pacific	57,135	51,129	37,377	108,274	72,973	+11.75	+52.08	+48.38	
Total—United States		476,584	440,024	369,582	916,276	710,386	+8.31	+28.95	+28.98	

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt.; Zone 2—N. J., N. Y., Pa.; Zone 3—Del., D. C., Fla., Ga., Md., N. C., S. C., Va., W. Va.; Zone 4—Ill., Ind., Mich., Ohio, Wis.; Zone 5—Ala., Ky., Miss., Tenn.; Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D., Zone 7—Ark., La., Okla., Tex.; Zone 8—Ariz., Colo., Idaho., Mont., Nev., N. M., Utah, Wyo.; Zone 9—Cal., Ore., Wash.

OVERHUNG ROTOR DESIGN

simplifies compressor installation and eliminates outboard bearing alignment problems



CLARK BROS. CO. • OLEAN, N. Y.

ONE OF THE DRESSER INDUSTRIES

Sales Offices in Principal Cities throughout the World

PRECISION BY THE TON

CLARK

balanced/opposed compressors

150-4500 HP

One of the many exclusive features of Clark Balanced/Opposed Compressors is the overhung rotor design.



With it, compressor installation is greatly simplified, floor space requirements are substantially reduced and alignment problems (inherent with outboard bearings) are nonexistent. Furthermore, elimination of the outboard bearing precludes bumping it out of alignment.

When the unit is operating, the magnetic lines of force fully support the rotor, with practically no weight carried by the integral bearing or shaft. Alignment is permanently built into Clark Balanced/Opposed Compressors.

For complete details on America's first and foremost Balanced/Opposed Motor-Driven Compressor — the compressor with *perfect balance* — write for Bulletin 118 and consult with your nearest Clark representative.



(Continued from page 37)

Stevens Manufacturing Co. has transferred its operations to a new plant at Lexington, O. . . Erler Pattern & Engineering Works has moved into a new Toledo, O., plant.

* * *

Nearing completion at Trenton, N. J., is a \$40 million testing facility for turbojet engines. It is expected to be placed in operation by the Navy this summer.

* * *

Ford Motor Co. of Canada has announced plans to erect a head office building in the Toronto, Ont., area . . . Garret Corp. has broken ground for a new administrative and engineering office building.

* * *

Reynolds Metals Co. is said to be planning the submission of a proposal to operate the Government's extrusion plant at Halethorpe, Md.

* * *

Brubaker Tool Corp. has acquired Morton Machine Works . . . Okanagan Helicopters, Ltd., has purchased Canadian Helicopters, Ltd., and its subsidiary, Smart Aviation, Ltd.

* * *

Wright Field Development Center has started production of new reinforced plastic fuel tanks.

* * *

Brush Electronics Co. now has on the road a mobile exhibition of instruments for sound measurements . . . Currently on tour for Consolidated Engineering Corp. is a truck-trailer containing five tons of electronic data-processing, process-monitoring, and control instruments.

* * *

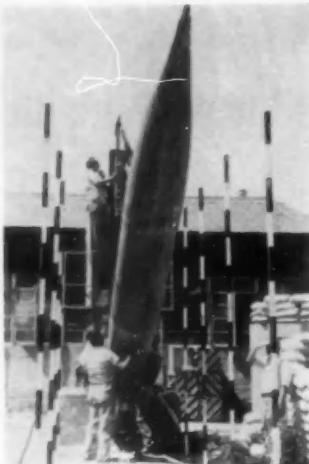
General Electric Co. has decentralized its Lamp Div. so that the miniature lamp business will be completely independent of both the large and photo lamp operations.

* * *

Lake Erie Engineering Corp. has delivered to McDonnell Aircraft Corp. a giant hydraulic press weighing 3.2 million lb.

* * *

Fairchild Engine & Airplane Corp. has appropriated over \$1 million for an accelerated program of boundary layer control applications to transport aircraft.



EJECTION PYLON TESTED

Outdoor tests of Pastushin Aviation Corp. determine ability of the company's new force ejection pylon to withstand pressure of forcible ejection of jettisonable fuel tanks and other external stores. Engineers are shown here fixing the tank to the pylon, which contains an explosive.

Industry News

(Continued from page 100)

Tests Emphasize Importance Of Keeping Car Doors Locked

Keeping automobile doors locked from the inside is an important safety precaution, according to recent tests conducted by Chrysler Corp. During "roll-over" tests at the Chrysler proving ground there was not a single case of doors opening accidentally when they were locked from the inside, the corporation reported.

Cars with locking plungers (tees) on the doors were found to be an additional safety factor. On Chrysler cars, for instance, the rear doors cannot be opened from the inside when the plunger is depressed.

Vickers to Consolidate Detroit Area Offices

Operations of 20 small offices of Vickers, Inc., in the Detroit area will shortly be consolidated into one unit. The company is now completing construction of a \$2 million administrative and engineering building in Troy Township north of Detroit.

Scheduled for completion early next year, the new facility will have 150,000 sq ft of space. Present manufacturing operations in Detroit will not be affected, the company said.

MEN in the NEWS

(Continued from page 41)

Beryllium Corp.—Lawrence F. Bolland was named vice-president in charge of sales.

De Soto Div., Chrysler Corp.—A. B. Nielsen was named general sales manager; Paul Herpolsheimer, Jr., assistant general sales manager; E. H. Hancock, director of organization; and Clarence E. Becker, national used car manager.

American Helicopter Div., Fairchild Engine & Airplane Corp.—Howard E. Roberts has been appointed general manager.

Chrysler Corp.—Charles B. Gorey, Jr., has been made special staff assistant and director of forward planning for Central Manufacturing.

Ford Motor Co., Tractor & Implement Div.—K. F. Morlen is now assistant general sales manager in charge of sales planning and analysis.

General Electric Co., Aircraft Gas Turbine Div.—Gerhard Neumann and George E. Fouch were made heads of the Jet Engine Dept. and Evendale Operating Dept., respectively.

Allen Electric & Equipment Co.—Byron Campbell has been appointed vice-president and director of engineering.

Thompson Products, Inc., Replacement Div.—Russ G. Riley has retired as special assistant to the manager of service sales.

Lee Tire & Rubber Co.—Anson G. P. Segur has been appointed sales manager.

Toledo Scale Co.—Robert E. Bell was made manager of research engineering.

Piasecki Helicopter Corp.—Lewis G. Sinnung was named director of procurement.

Goodyear Tire & Rubber Co.—Joseph F. Hutchinson has been named manager of the Automotive Engineering Div., succeeding J. C. Tuttle, now consulting engineer. Gene C. Huffman has become superintendent of the Metal Products Div.

Aro Equipment Corp., Aircraft Products Div.—R. B. Blythe has been named assistant to the vice-president, and D. W. Orrick has been chosen sales manager of aircraft products.

Warner Electric Brake & Clutch Co.—John Dewey has been made Chicago branch sales manager.

(Turn to page 138, please)

Use 52100 steel for parts like these:

- 1. Diesel injection pumps**
- 2. Lathe centers**
- 3. Slitting rolls and knives**
- 4. Cam rollers for automotive steering gears**
- 5. Machine tool parts**
- 6. Pump parts**
- 7. Aircraft engine parts**
- 8. Mechanical seals**
- 9. Saw mill rollers**
- 10. Ball bearings**
- 11. Asbestos disintegrators**
- 12. Mill rolls**

...and get all these advantages:

- 1. Hard**
- 2. Tough**
- 3. Machines easily**
- 4. Exceptional wear-resistance**
- 5. High tensile strength**
- 6. Withstands working pressure of 200,000 p.s.i.**

BECAUSE it's an alloy steel of high carbon analysis, Timken® 52100 has high tensile and fatigue strength. It's fully spheroidized structure makes machining easier. It has high hardenability throughout its cross section and can be oil quenched to a maximum hardness of 65/66 Rockwell C.

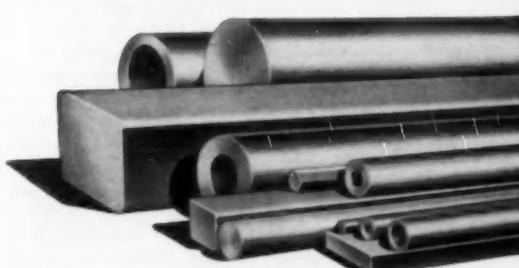
You can get 52100 steel from the Timken Company in all three finished forms: bars, tubes, wire. For your small run or emergency requirements, we maintain a mill stock of 101 sizes of 52100 tubing—from 1" to 10½" O.D. We can ship it in

less-than-mill quantities within 24 hours after you order.

You're assured of uniform quality in every shipment because we control quality at every step in production. The Timken Company is one of the world's largest producers of 52100 steel, and America's pioneer producer of 52100 tubing.

For a stock list of available sizes, grades and finishes, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

News of the MACHINERY INDUSTRIES

(Continued from page 79)

that savings can be effected in manufacturing cost. These economies, according to the company, will offset recent increases in production expense and raw material cost. E. P. Cunningham, Clearing's vice-president in charge of sales, feels that this production and sales program will answer the customers often-asked question, "When do we get it?"

Colonial Goes European

According to Colonial Broach Co., Detroit, sales for its line of broaches has been on the upswing in Europe. This increase has prompted Colonial to license Maskin A/B Thule, Maimo, Sweden, to produce Colonial equipment for the European market. Under the agreement, the products—broaching machines and broach sharpeners—will be trade-named "Colonial-Thule." Arvid O. Lundell, Colonial president, believes that an even greater share of the market can be obtained due to faster delivery schedules and readily available engineering facilities to the Continental buyer.

Europe Buys Most U.S. Machine Tool Exports

In a recent report on foreign trade compiled by Machinery & Allied Products Institute, the dollar volume figures for 1954 machine tool exports show that European nations purchased \$45.4 million worth or 52 per cent of the total exports. The year-end figure, however, is a 43.5 per cent decrease from the 1953 dollar volume. Runners up in the machine tool category are Canada with \$22.2 million and Latin America with \$8.9 million. For other industrial machinery, except metalworking, Latin American countries were the leading purchasers.

Shows

The Canadian Industrial Tool and Equipment Show, Montreal, formerly known as the Montreal Industrial Tool and Equipment Show, will be held in the Show Mart Building, Montreal, October 24th to 28th.

The next International Machine Tool Exhibition to be organized by the Machine Tool Trades Association

(of Great Britain) will be held at Olympia, London, England, from June 22nd to July 6th, 1956. There will be no other major exhibition of tools in Europe during that year.

Automatic Transmissions in the Economy Run

(Continued from page 59)

economy performance of the torque converter transmissions. In the excitement of such performance features as acceleration and smoothness we have been apt to overlook the fine economy features designed into these engine-transmission-rear axle combinations. One large torque converter type car turned in a fine mileage record. While this was not a surprise to its designers, it was certainly a pleasant surprise to a lot of people who thought of it only as a power plant and had completely overlooked its mileage potential.

Certainly all the information from the run points to progress. It is an increasingly dramatic proof of better values to the motoring public.

BOOKS...

THE PRACTICAL ENGINEER POCKET BOOK, edited by N. P. W. Moore, published by Pitman Publishing Corp., 2 W. 18th St., New York, N. Y. Price, \$3.00. Further revision has taken place in the preparation of this new edition. An entirely new section has been added on industrial hygiene; the section on bearings and mechanical transmission has been largely rewritten, and the locomotive section has been revised and extended. In the preparation of new material and in the revision of existing sections, an endeavor is made to present sufficient of the underlying principles of the field to permit the reader to extend the examples and data given to the problems of his immediate concern. The practice of giving clear references to more complete sources of specialized information has been retained and extended. Technical dictionaries in French, German, and Spanish are included.

SYNOPSIS ON DIESEL FUELS, published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, \$1.50. The papers in this Symposium were presented at a meeting of ASTM Committee D-2 on Petroleum Products and Lubricants. Outstanding technical men representing both producers and consumers prepared the papers presented in this publication. The Symposium was designed to cover all phases of the Diesel fuel picture. Of the nine papers presented in this Symposium, eight papers were prepared covering the Diesel fuel supply and demand outlook, and the various problems associated with the procurement and usage of Diesel fuels, while one paper is a review of fuel specification requirements.

AUTOMATION News Report

(Continued from page 67)

ELECTROLYTIC SHAPING

Anocut Engineering Co. recently was formed to develop and manufacture equipment for automatic electronic control of electrolytic shaping systems. Only recently emerged from the laboratory, electrolytic shaping has been responsible for reductions in the cost of grinding and working with such materials as the carbides, titanium, alloy steels and the new honeycomb materials recently introduced to the aircraft industry. Offices are in Room 2300, Board of Trade Bldg., Chicago. The company maintains laboratory and manufacturing facilities at 631 W. Washington Blvd. in that city.

LABORATORY ON WHEELS

An instrumentation laboratory in a 28-ft van trailer has been outfitted by Armour Research Foundation of Illinois Institute of Technology, Chicago. It will be used especially on projects where it is impractical to move equipment or material to a fixed laboratory, according to G. H. Brittain, acting supervisor of the Foundation's mechanics instrumentation section. First assignment will be to evaluate the performance of a rock crushing machine at a quarry. By analyzing data obtained while the machine is operating, research engineers will be able to appraise its performance and determine the design changes necessary to improve the overall operating efficiency, Brittain said. The mobile laboratory is equipped to measure and record pressure, stress, strain, thrust, torque, acceleration, velocity, temperature, and many other mechanical phenomena.

AUTOMATION GATHERING

"Electronics and Automatic Production" will be the theme of a national symposium on current technical developments, social and economic implications and the outlook for automation next August 22 and 23 in San Francisco. Jointly sponsored by the National Industrial Conference Board and the Stanford Research Institute, the two-day meeting will immediately precede the annual Western Electronic Show and Convention scheduled for San Francisco the same week. More than 500 exhibitors are scheduled for the Show, August 24-26. Chairman is Noel E. Porter, Hewlett-Packard Co., Palo Alto.

Let aircraft structural plastics experience integrate your designs

both · **inside**

· and **out!**



HERE is success in structural plastics, design experience and facilities without parallel—ready to put your automotive design years, and dollars, ahead of the field.

It is an outgrowth of service to the Jet Age—aeronautical pioneering, where our reinforced plastics met and passed the "acid test."

Our challenge was not the usual small-part substitution of plastics for metal. At Goodyear Aircraft we have designed and produced complete exterior structural plastic sections of many of today's fastest and largest aircraft.

As a result, we have skills, techniques and successes which can integrate your designs—both inside and out—make the interiors and bodies of your cars and trucks

startlingly new and strikingly efficient.

For example, we can make one-piece "unitized" moldings of complete cabs or van assemblies for trucks—including the framework and skin—in a single piece.

We can produce interior door panels, armrests, and the like, which integrate ash trays, electric window switches and other accessories—eliminating subassembly.

From battery racks to complete, integrated fender and body designs, we can produce for you in quantity—coupling good die-design experience with press capacities up to 700 tons and platen sizes up to 14 feet.

For complete information, we invite you to write: Laminated Products Development, Goodyear Aircraft Corporation, Akron 15, Ohio. Plants in Akron and in Litchfield Park, Arizona.

GOOD^YEAR AIRCRAFT

New Materials and Methods For Industry—the result of aeronautical pioneering

Counteracting Design Changes in Jet Engine Output

(Continued from page 65)

chine is qualified by the laboratory before production is started on any part; and each machine is qualified hourly to assure maintenance of qualified welds. Moreover, a high percentage of individual pieces are checked and X-rayed by the laboratory before acceptance.

The long turbine shaft involves a

variety of exacting machining operations, since it is finished all over. The first operation is handled in one of three enormous Wickes lathes, as shown. The boring bar is at one end of the machine, the turret head on the opposite end. In machining the cavity at the flange end, the work head is arranged to move in and out

on the slide by means of tracer attachment, the turret head being fixed on the bed. These big machines have hydraulic actuation.

Large Monarch tracer-controlled lathes are employed for turning the external contour of turbine shafts; while a vertical Barnesdril honing machine is used for honing the bore. Monarch tracer-controlled lathes also are used for machining the large hubs.

Versatile Cincinnati Hydroform equipment has been harnessed for the making of many deep drawn parts having considerable complexity of contour. Its usefulness here stems from the fact that such formations can be readily produced from a simple circular blank. Dies are made of Kirksite and the gamut of parts can be run in batches on a single machine simply by changing dies.

It was interesting to find that Ford does machining on buckets for the "hot" end. Precision-cast buckets—made of special heat-resistant alloys—are supplied in as-cast form by suppliers. This process produces an accurate airfoil bucket section that requires no further machining. However, it is necessary to machine the root or "Christmas tree" and the shroud end at the tip.

The present process is quite interesting. Before any machining is done, each bucket is set up in a special machine, fitted with a J & L Comparator. It is aligned in the fixture in such fashion as to hold precise alignment of the airfoil section. After the bucket has been thus aligned, the operator fits a "shuttle block"—a square shaped fixture with machined locating spots—over it, then pours molten Cerrabend (low melting point white metal compound) into the block to freeze it securely. The bucket then is ready for machining, remaining in the shuttle block until machining has been completed.

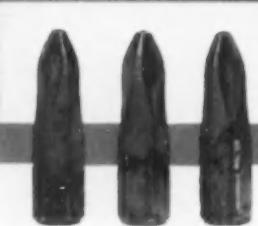
Grinding of the root serrations is done in special Ex-Cell-O grinders. Grinding of the ends of the root is done in J & L and Thompson grinders.

Special Norton grinders, illustrated here, handle the grinding of the OD contour on the shroud end. As shown, the shuttle blocks are clamped in a rotary indexing fixture, feeding each blade to the grinding wheel head.

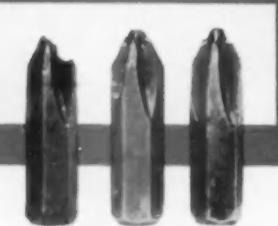
As noted earlier, the constant flux of engineering changes not only covers changes in design detail, it also includes modifications designed to simplify manufacturing methods and reduce costs. In the case of buckets, Ford is shifting to a major change in

(Turn to page 112, please)

There's a NEW Difference in Bits!



ZEPHYR BITS



OTHER MAKES

LOOK AT THESE UNRETouched PHOTOGRAPHS—Zephyr's Bits look good as new. The others are spent.

Both underwent the same rough test—driving No. 2, round head Phillips screws into undersize holes of .072 gauge body steel at 750 RPM, under 60-inch-pound torque load.

Repeated time and again, tests prove IN EVERY INSTANCE that Zephyr Bits average twice the ruggedness of other makes.

Why ZEPHYR Bits last longer...save time and money

ZEPHYR FORGES BITS BY AN EXCLUSIVE PROCESS—Controlled heat treatment gives them that extra toughness modern assembly lines demand. To make certain they perform as promised, every batch of bits undergoes severe torque driving and wear test before delivery...assurance to us and assurance to you of complete satisfaction.

ZEPHYR

Insert and Power Bits
FOR PHILLIPS OR FRIESEON FASTENERS

Write for ZEPHYR Bit Catalog No. 12B for complete line of ZEPHYR Bits



ZEPHYR MANUFACTURING COMPANY, INC.
Accessories Division • Inglewood, California

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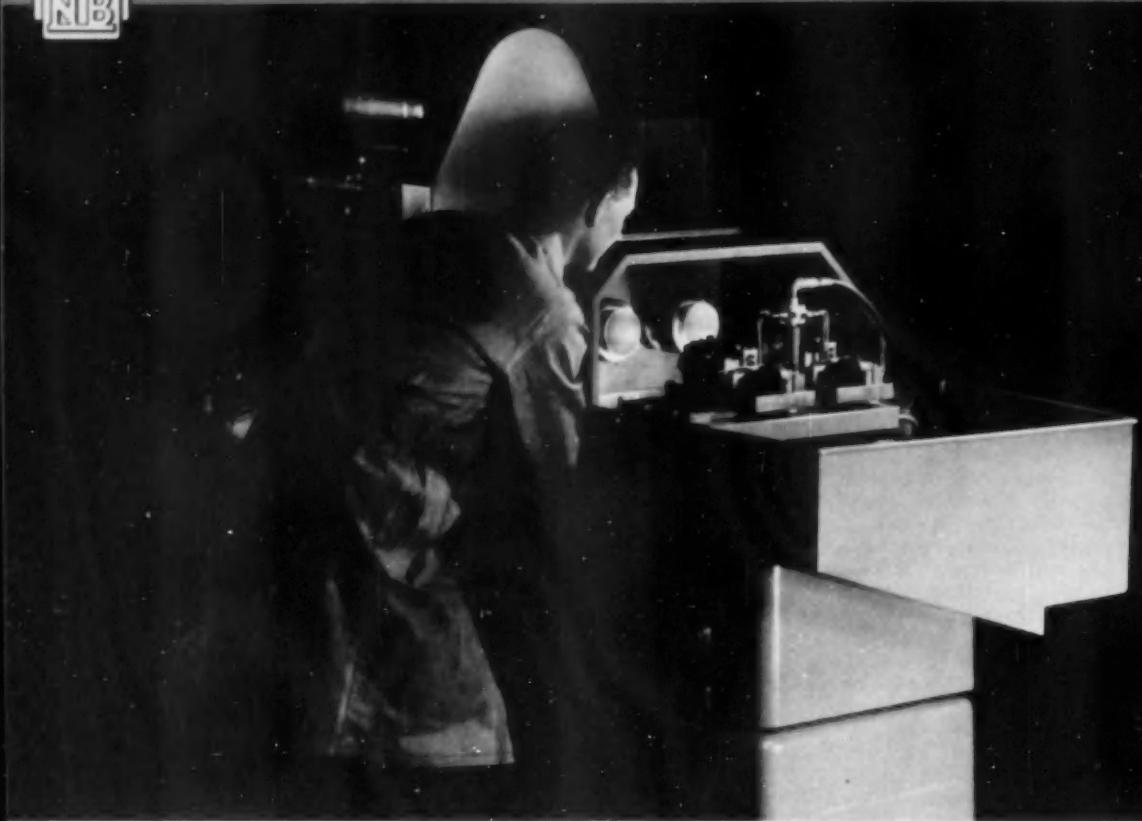
Sales Up . . . Profits Down?



**The Answer is New Methods
on NEW BRITAIN**

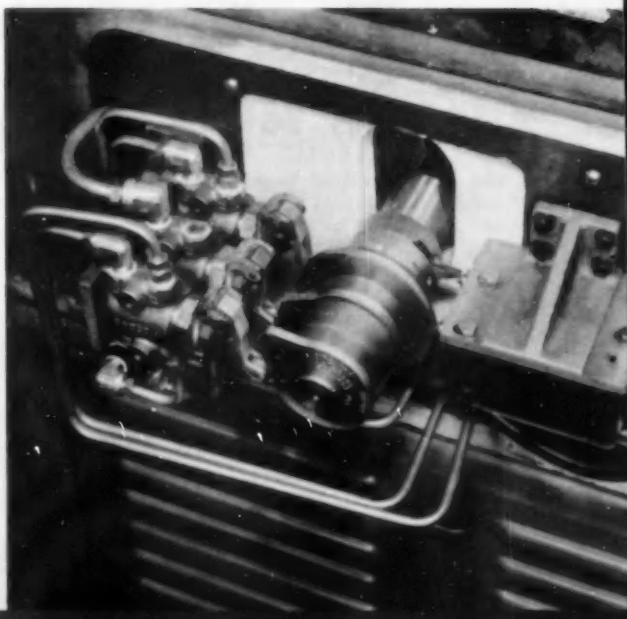
- AUTOMATIC CHUCKERS
- MULTIPLE SPINDLE BAR MACHINES
- SINGLE SPINDLE AUTOMATICS
- PRECISION BORING MACHINES
- LUCAS PRECISION HORIZONTALS
- NEW BRITAIN +GF+ COPY LATHES

See the following four pages for other New Britain New's.



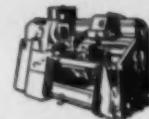
The secret of precision boring is constant close control of the tool

Precision-ground cams assure accuracy of tool paths under all conditions on a New Britain Precision Boring Machine. Equally important is split-second control of cycle timing. This is accomplished by means of the program drum illustrated at the right. Cams and trip dogs accurately time all motions of the tool and the machine units. It is enclosed by a lift-off cover and is immediately accessible from the operator's side of the machine. These are important features of the New Britain approach to more profitable precision boring.





New Britain +GF+ Copying Lathe combines 2 operations in 1 pass

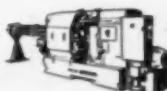


Yes, we taper turn the shaft end of this gear blank and copy turn the rest in the same operation — which keeps the cost of the piece down. This happens all the time on a New Britain +GF+ copying lathe. You can spot other examples of it in the other pieces on the table.

The New Britain +GF+ is a copy turning machine, not a lathe with an attachment. The copy slide is part of the carriage for taking heavy cuts at carbide speeds. Contoured work in small lots or on an automated basis, is accurately turned from a simple template on the front of the machine.

The secret of carbides on bar machines is elimination of slide deflection

Carbides won't tolerate sloppy feeds. Positive slide actuation on a Model 601 New Britain Automatic results from mounting the cams directly behind the slides. A plus benefit is that cross slide feed changeovers can be made in minutes with these pick-off cams.

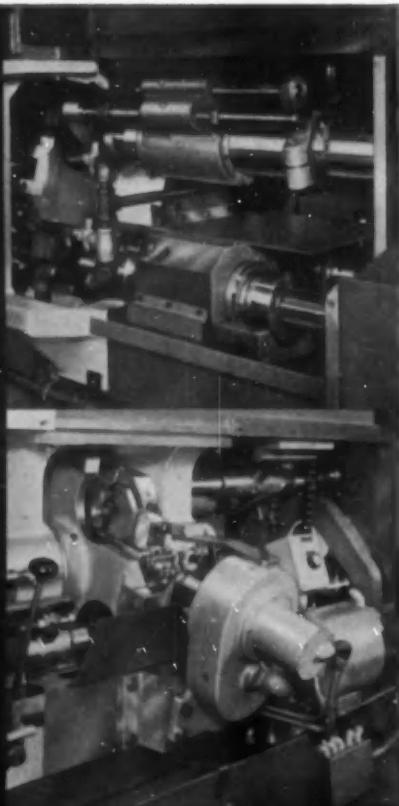
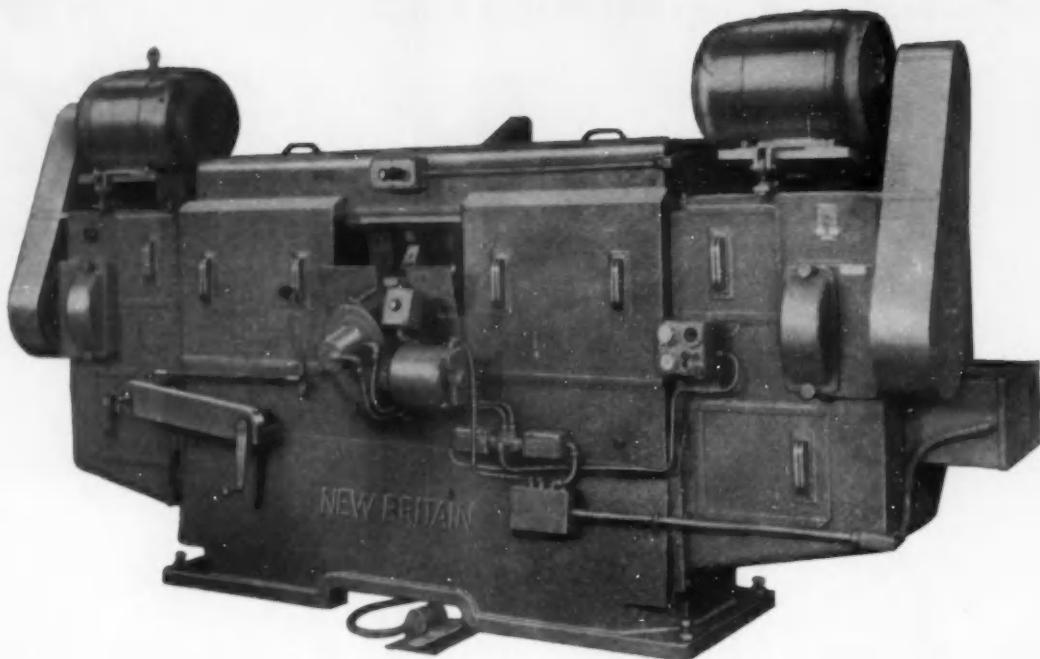


See the preceding two pages and the two following for other New Britain News.





Six-spindle production in "Three-spindle" time



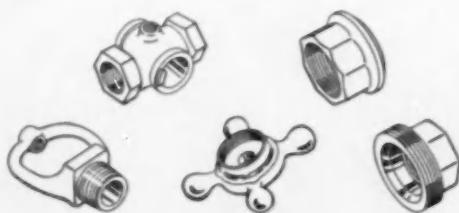
View of the rear side of the machine with the guards removed, showing the two lower spindles and the upper threading spindle.

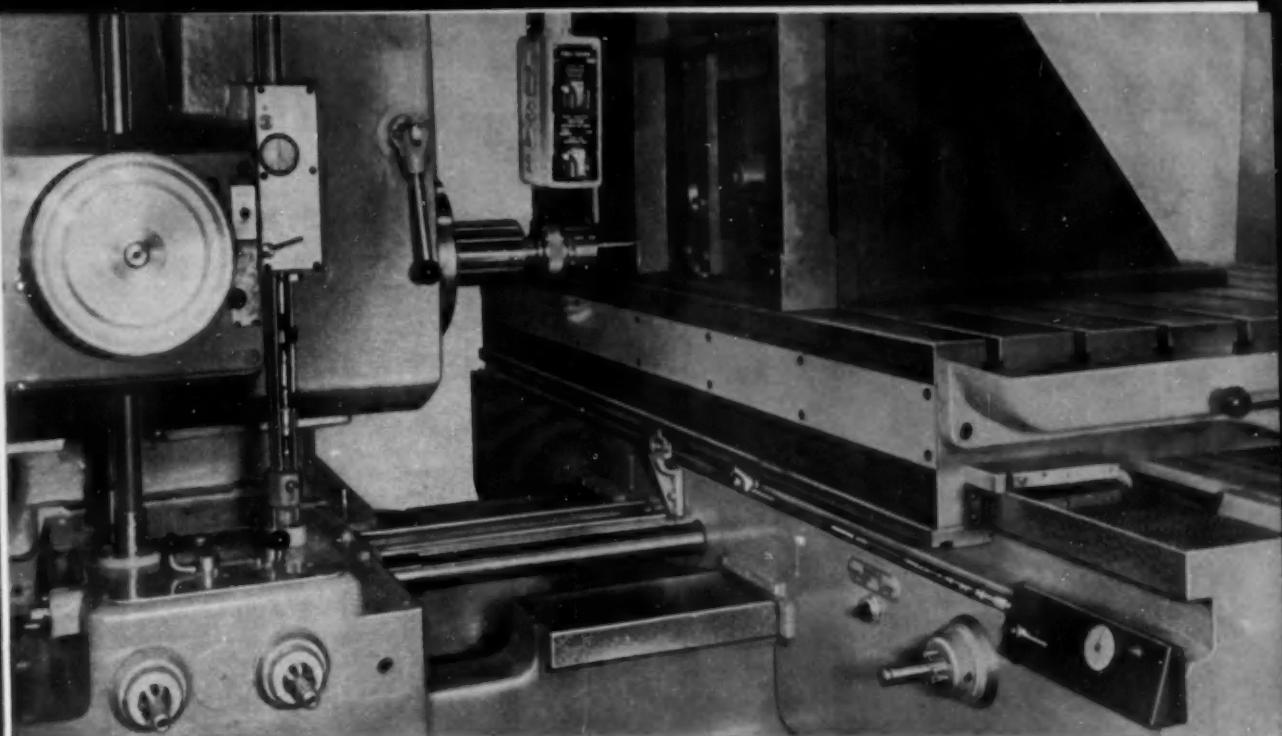
All controls are within easy reach of the operator. Chucking is accomplished during the operational cycle by manual or semi-automatic means.

This new double-end New Britain Model 365 chucker is specifically for parts which can be machined simultaneously at both ends in one chucking, or two pieces per cycle.

It furnishes the *high spindle speeds* required for work on brass and aluminum, plus *beef* for machining and threading steel, plus *accuracy* guaranteed by a new turret locking mechanism. Idle time is minimized by power chucking and rapid traverse of all slides.

If your requirements include accurate volume production of double-end work, the Model 365 New Britain chucker can be a highly efficient money-maker for you. For more information, please ask for the catalog on Model 365.

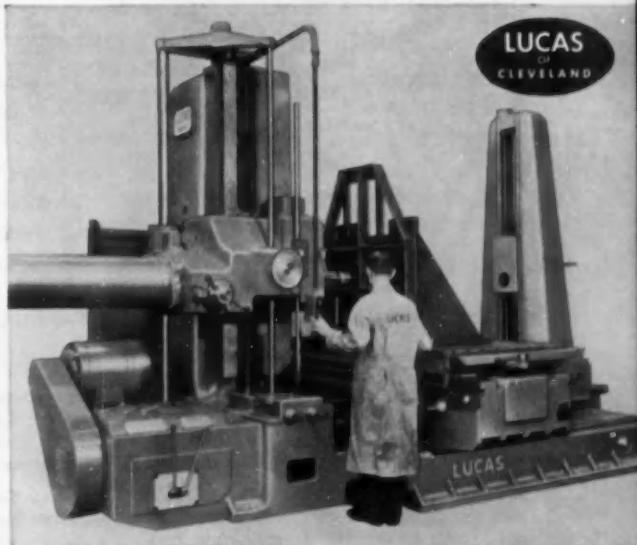




Automatic Power Positioning is a money-maker on boring machine jobs

The entire operation of setting the head and table is done through power feeds at rapid traverse speed. The operator simply inserts the proper measuring rods and starts the positioning cycle. It takes an absolute minimum of time and reduces the chance of error in locating bore centers.

Lucas pioneered and specializes exclusively in building the horizontal boring machine. The full possibilities of this multi-purpose machine are enjoyed by Lucas owners, because of the many important Lucas features and improvements — including Automatic Power Positioning, new simplified pendant control and many more. May we send you the latest descriptive Lucas catalog. Address Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland 8, Ohio.



* AUTOMATIC BAR and CHUCKING MACHINES * PRECISION BORING MACHINES
* LUCAS HORIZONTAL BORING, DRILLING and MILLING MACHINES * NEW BRITAIN +GF+ COPYING LATHES

The NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division, New Britain, Connecticut
Lucas Machine Division, Cleveland 8, Ohio

See the preceding four pages for other New Britain News.

THOMSON

NYLINED[®]

BEARINGS



...with Smooth, Tough,
DuPont NYLON!

...OFFER YOU THESE IMPORTANT BENEFITS

- LOWER COST
- RESIST CORROSION
- NO LUBRICATION
- EASILY INSTALLED
- MINIMUM SPACE
- DAMP VIBRATION
- OPERATE IN LIQUIDS
- CLOSE FIT
- NO FRICTION OXIDATION
- RESIST POUNDOUT
- SELF-RETAINING
- RESIST ABRASION
- LOW FRICTION • SILENT
- LIGHTEST WEIGHT
- NON-CONTAMINATING
- LESS MAINTENANCE
- INSTANTLY REPLACEABLE
- LONGER LIFE

Engineered to Solve Problems...Improve Products...

Reduce Costs!

NYLINED Bearings are a highly engineered thin liner of Dupont Nylon, designed to bring bearing users the many benefits of Nylon as a bearing material by solving most of the limitations surrounding its use. The compensation gap principle assures maintenance of diametral tolerances for precision applications.

Available in 4 standard types, 10 standard sizes...from stock. Other types and sizes may be inexpensively tooled for production applications. For catalog containing data on advantages, applications, standard sizes, prices, special types, load ratings, engineering information, evaluation chart, installation methods ... write to

*REG U. S. PAT. OFF.



THOMSON INDUSTRIES, Inc.
DEPT. I. MANHASSET, NEW YORK

Also—**MANUFACTURERS OF BALL BUSHINGS...The Ball Bearing for Linear Motion**

Jet Engine Design Changes

(Continued from page 106)

process, designed to reduce the steps involved in machining the root and shroud. Here they are committed to a special surface broaching setup using a battery of Detroit vertical broaching machines.

Each of these machines is of dual ram type with two work stations. In the sequence of events, each bucket progresses through each of the four stations by manual indexing. In the process, the root end is serrated and broached to width; and the shroud end is broached on all sides. The only separate operation then required is the grinding of the OD formation in the Norton grinders. It may be noted that each of these machines is hydraulically actuated, and requires two 50-hp motors for this purpose.

In general, Ford is taking advantage of all known techniques in many directions. For example, in making stampings such as vanes which are formed from stainless steel strip, each strip is protected by cementing a special kind of paper over the strip. This sheet adheres to the strip throughout the press operations, prevents scratching of the surface, eliminates the need for a special drawing compound.

BOOKS ...

VIBRATION PROBLEMS IN ENGINEERING, by S. Timoshenko, published by D. Van Nostrand Co., Inc., 250 Fourth Ave., New York 3, N. Y. Price, \$8.75. Through two previous editions and nine separate printings, this standard work has provided both advanced students and practicing engineers with the fundamentals of vibration theory and their application to the solutions of many technical problems. From the balancing of machines, the torsional vibration of shafts and geared systems, to the vibration of turbine blades and disks, railway track and bridges, and foundations, these and many other areas of investigation can be thoroughly understood only on the basis of the theory of vibration. This new edition reflects the very latest information on the subject.

CONVEYORS AND RELATED EQUIPMENT, by Wilbur G. Hudson, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, \$9.00. This third edition of a well-known and widely useful book on materials handling and related equipment offers concrete information on all phases of the subject. Many new photographs have been added, while obsolete pictures have been deleted. Typical problems and their solutions have been included.

This is the ninth of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

The Effect of Nickel in Alloy Steels

Each element in an alloy steel has its own particular job to do, and each is included with a special purpose in mind. What are some of the reasons, say, for using nickel, chromium, molybdenum, vanadium, and other components that appear in the various analyses? The elements in any alloy steel work both individually and as a team. What does each one do? In this and subsequent discussions we shall try to answer these questions, beginning with nickel, one of the fundamental alloying elements.

Nickel increases toughness and resistance to impact, particularly at low temperatures; lessens distortion in quenching; improves corrosion-resistance. It lowers the critical temperatures of steel and widens the temperature range for successful heat-treatment.

Nickel steels are particularly suitable for case-hardened parts, such as aircraft-engine gears and roller bearings. Such steels provide strong, tough, wear-resistant cases and also ductile core properties.

Advantages imparted by nickel are not restricted to quenched-and-tempered steels. Nickel often permits given strength levels to be obtained at considerably lower carbon contents, thereby markedly in-

creasing toughness, plasticity, and fatigue-resistance. Nickel steels are therefore highly suitable for applications where liquid quenching is not employed, such as high-strength structural steels used in the as-rolled condition or heavy forgings not adapted to quenching. Products of this nature must develop superior properties after nothing more severe than air-quenching treatments.

If you would like to know more about nickel steels, or need information about other types of alloy steels, please feel free to consult with Bethlehem's metallurgists. These technicians will gladly advise you regarding analyses, heat-treating, machinability, etc. You are invited to make use of their services whenever you need assistance.

And may we remind you, too, that Bethlehem makes all AISI standard alloy steels, as well as special-analysis steels and the full range of carbon grades. We are always in a position to meet your needs promptly and fully.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

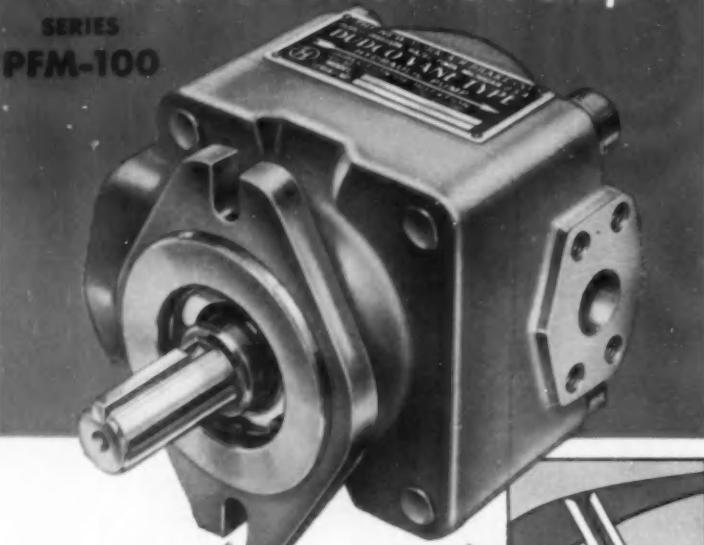
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



BETHLEHEM STEEL

DUDCO PRESENTS . . .
for MOBILE EQUIPMENT
a New Dual-Vane Pump

**SERIES
PFM-100**



*2000 psi
Continuous Duty
3 to 11 gpm*
 at 1200 rpm
 0 psi

This Pump was engineered to meet the special conditions characteristic of service on mobile equipment.

Here is a pump designed for high speed direct engine drive that can be operated continuously at 2000 psi and 2000 rpm to meet the continuing demand for more work from your equipment.

The exclusive DUDCO Dual-Vane design provides and assures complete hydraulic balance of all internal parts. Bearing loads and cam ring wear are reduced so DUDCO PFM-100 Pumps last longer.

Designing these Pumps into your machines is made easier because all standard S.A.E. or industrial mountings and piping provisions are available, as well as complete flexibility of port positions.

PFM-100 Series Pumps are priced for the competitive mobile equipment market . . . NO price penalty for high pressure equipment.

Write— for complete information on the new DUDCO PFM-100 Series DUAL-VANE Hydraulic Pump.

DUDCO DIVISION
 THE NEW YORK AIR BRAKE COMPANY

1105 EAST 222nd STREET • CLEVELAND 17 • OHIO
 INTERNATIONAL SALES OFFICE, 90 WEST ST., NEW YORK 6, N.Y.

Radio Controlled Trucks

(Continued from page 72)

A shortwave transmitter, operating on a frequency of 152.93 megacycles with 50 watts of power, is located in the foreman's office. His desk faces that of a radio operator, often a girl, who does much of the dispatching. Calls for trucks are phoned in here, and the operator relays each call to the unengaged truck nearest the scene of desired action.

The plant engineering fleet is similarly controlled but from the plant engineering department. This department is connected by closed telephone circuit to the transmitter in Ver Hoeven's office, and calls originating in plant engineering go out unimpeded over the same transmitter. They are returned by plant engineering truckers in the same fashion.

All trucks have call numbers, and confusion over identity is thereby avoided.

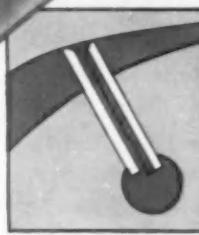
Spectacular time savings at Rochester Products have been made by radio control, and needless backtracking eliminated. Before the advent of two-way radio, Ver Hoeven's office, for instance, often had only a general idea of where a truck might be. Between assignments it would be cruising around for work and was available to the first foreman who flagged it down.

Thus, locating a truck under the old system could be quite a job. If phone calls to departments where the truck might have stopped were unsuccessful, Ver Hoeven's office sought help from the plant's public address system. But at that moment the paging service might be loaded, with four or five other calls awaiting their turn. Ver Hoeven's office had, in effect, to get in line.

Even when the message went through, the trucker wouldn't always hear it if he happened to be in a noisy area. Sometimes, after receiving the page, he'd have trouble trying to reach the office from the nearest phone, because the line would be busy. He might then decide to try again in a few minutes from another phone farther up the aisle. Occasionally he would forget. Only another paging effort, with complications possibly repeated, would remind him.

While Ver Hoeven was faced by frustrations with his fleet, the plant engineering department was encountering similar vexations with its own.

In addition, the receiving department had a slightly different set of



TWO VANES ARE BETTER THAN ONE

The hydraulically counterbalanced DUAL-VANES in DUDCO Hydraulic Pumps eliminate wear producing loads normally caused by unbalanced hydraulic forces and vane acceleration. DUAL-VANES also maintain MULTIPLE SEALING BARRIERS to slippage and power loss. DUAL-VANES are a patented and exclusive DUDCO feature.

problems with its outside pick-up trucks. Every morning one such truck normally makes two trips of eight or 10 calls each about town, returning just before lunch hour. In the past it had often been highly desirable to contact the driver, as, for example, to direct him to make an extra stop while downtown, thus avoiding a special trip later in the day. Rochester Products is on the outskirts of the city, and a round trip to the business district can easily consume an hour or more.

Reaching the driver by phone at one of his numerous stops was a hit-or-miss proposition. Now, however, the two-way radio carries the message to him direct, saves additional time, and eliminates special trips.

Station KED668 has a broadcasting radius of about 20 miles. Its reception ability is similarly limited, and theoretically it should not encounter any interference on its assigned frequency. But unusual atmospheric conditions occasionally provide freaks. Once, after a thunderstorm, a Shortsville, N. Y., station 40 miles away came in clearly, and another time a shortwave station in Canada was heard.

KED668's operating frequency is assigned by the Federal Communications Commission, and the station must conform to the strict regulations governing all radio communications. A plant electrician who is also a licensed service-man is constantly available to keep the station on frequency, and has to check every set periodically. Each operator or dispatcher must have a restricted radiotelephone operator's permit from the FCC, and all truckers are similarly licensed. Rochester Products' two-way communications system, like others, is strictly for business purposes, and banter, profanity, and obscenity are forbidden by the FCC which maintains a monitoring system to detect irregularities. The penalty for violations may be suspension of an individual's license or, in repeated cases, of a station's operating permit.

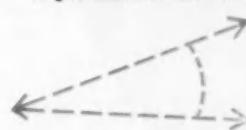
Rochester Products' decision to install two-way radios grew out of a foreman's suggestion that a system of signaling lights for truckers be spotted about the plant. The division considered the idea favorably until it discovered that for a small additional cost it could have the far more flexible and efficient two-way communication system.

Rochester Products is satisfied today that its increased investment has come back a hundredfold.

KED668 has one other feature com-



Even simple functions may entail special configurations to give maximum results...



Or, when the function involves motion in more than one direction, custom design develops mountings to suit the application...



Or cylinder movement in any direction, and many other variables are yours with HYDRECO Custom Design.

For the engineer whose target is equipment that will outperform any comparable unit—the special facilities offered by HYDRECO can materially assist in attaining the objective. Not with so-called "standard" cylinders but rather with cylinders custom engineered and built to do the specific job.

Requirements of space, mounting, or hydraulic connections that could never be met by "standard" cylinders, can be fulfilled easily through custom designing.

And too, HYDRECO's variety of experience in designing and building special hydraulic components in volume production can keep the product costs within the budget.

That which is true of HYDRECO Cylinders is equally true of HYDRECO Pumps, Motors and Valves. To improve the performance of existing equipment or to add functions and complete dependability to projected designs—look to HYDRECO Oil Power!

WRITE—

for full information today on HYDRECO Pumps, Motors, Valves and Custom Built Cylinders.

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THE NEW YORK AIR BRAKE COMPANY

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INTERNATIONAL SALES OFFICE, 90 WEST ST., NEW YORK 6, N. Y.



Sometimes,
when you're looking for
golden eggs...

You have
to find a
new goose

Sometimes very good men waste their time in unproductive jobs with unimaginative companies, when they should be building their futures with a forward-looking organization that wants them to move ahead.

Fairchild wants good, experienced engineers, the sort of men who'll insist on the right to progress as fast as their abilities warrant.

Right now, aerodynamists with experience in Boundary Layer Control have a splendid opportunity with Fairchild to take part in Fairchild's pace-setting research and development in this vital field. The right men will be assured good futures, high salaries, and plenty of room ahead to progress in.

Send your resume today to Walter Tydon, Chief Engineer.


ENGINE AND AIRPLANE CORPORATION
FAIRCHILD
Aircraft Division
HAGERSTOWN, MARYLAND

"where the future is measured in light-years"

plementing its normal operations. A portable two-way radio, which can be carried on a supervisor's back like the old walkie-talkies of World War II, keeps him in touch with the transmitter office as he patrols the plant or yard, seeking areas where trucks may be advantageously employed. His recommendations are then relayed to a trucker. The yard is so spacious, incidentally, that the normal public address or paging system, though it has outside speakers, cannot always reach the supervisor, whose duties frequently require him to investigate remote sections of the 64-acre tract. Thus, the two-way radio serves still another purpose.

Internal Engine Parts Televised in Operation

(Continued from page 51)
flaws in metallic equipment. However, until now their use in studying the internal operation of heavy machinery has been confined largely to X-ray photographs. Suitable methods for observing the interior of a mechanism while it operates have been lacking.

The Bureau's system makes use of an instrument called a pattern amplifier, which acts as an X-ray intensifier, continuously detecting, amplifying, and displaying low-intensity X-ray images. The major component of the pattern amplifier is the converter—a large, cylindrical, thallium-activated sodium iodide crystal, which converts X-ray images into optical images. When bombarded with an X-ray beam, the crystal emits visible light. If the flat faces of the crystal are perpendicular to the X-ray beam, a visible replica of the X-ray image may be observed along the beam axis. When the pattern amplifier is used in conjunction with a high-intensity, high-energy X-ray source such as the NBS synchrotron, it can continuously display images of parts hidden by as much as 18 in. of steel or 7½ ft of concrete. The visual image may be detected in several ways. It may be observed directly by eye, photographed with an ordinary camera, or observed with a remotely controlled television camera.

AUTOMOTIVE INDUSTRIES . . .

is your News Magazine of
Automotive and Aviation

MANUFACTURING

Additives recently developed to meet changing fuel and lubricant needs

**DuPont Petroleum
Laboratory reports
rapid progress in
development of
additives to improve
performance of auto-
motive fuels and
lubricants.**

Stop-and-go city driving amid creeping traffic congestion, high-speed turnpike driving, and the growing use of diesel power are important factors in our rapidly changing automotive industry. As they develop and progress, new problems involving automotive fuels and lubricants are encountered.

To help you solve these problems, the Du Pont Petroleum Laboratory is constantly at work on the development of new chemical additives for fuels and lubricants. Here is what you will want to know about three of the recently-developed additives which are now in commercial production.

New Du Pont Lube Oil Additives 564 and 565

Now, for the first time, an effective detergent can be added to overcome sludge problems caused by low-duty, stop-and-go

engine operation. And the same additive is also a viscosity-index improver.

What's more, there is a choice of two different additives for this purpose—Du Pont Lube Oil Additives 564 and 565. Both are new-type, ashless, polymeric additives with outstanding detergency and varying in shear stability and viscosity-index improving properties. Of the two, the lower molecular weight of LOA-564 provides good shear stability while LOA-565, with a higher molecular weight, is ideally suited for motor oils where high viscosity improvement at low cost is a major objective.

How effective are they?

To evaluate the efficiency of LOA-564, a representative number of taxicabs were tested, starting with new engines, in 50,000 miles of low-duty service (with oil-drain periods at 4500 to 5000 miles). Typical results are indicated in the photographs below.



NOTICE THE DIFFERENCE in sludge on the oil screen and timing gear cover on the

left as compared with the clean appearance of the corresponding parts on the right. Those on the left were operated on a representative heavy-duty, 10W-30 motor oil (for service MS and DG). The cleanliness of those on the right resulted from the use of the same base oil to which Du Pont Lube Oil Additive 564 plus an antioxidant and additional V.I. improver had been added.

FOA-2 for diesel fuels

Although it has been in commercial production only a relatively short time, Du Pont Fuel Oil Additive No. 2 has already proved its effectiveness as a stabilizer and dispersant for diesel fuels, as well as for heating oils.

Because of its excellent dispersant action, FOA-2 improves the filterability of diesel fuels. In this way, it helps to eliminate most injector-sticking and filter-plugging problems. It's extremely economical to use, too, because it is effective in low concentrations.

For more detailed information about any of these additives, address your request to any of our regional offices listed below.



Better Things for Better Living
... through Chemistry

Petroleum Chemicals

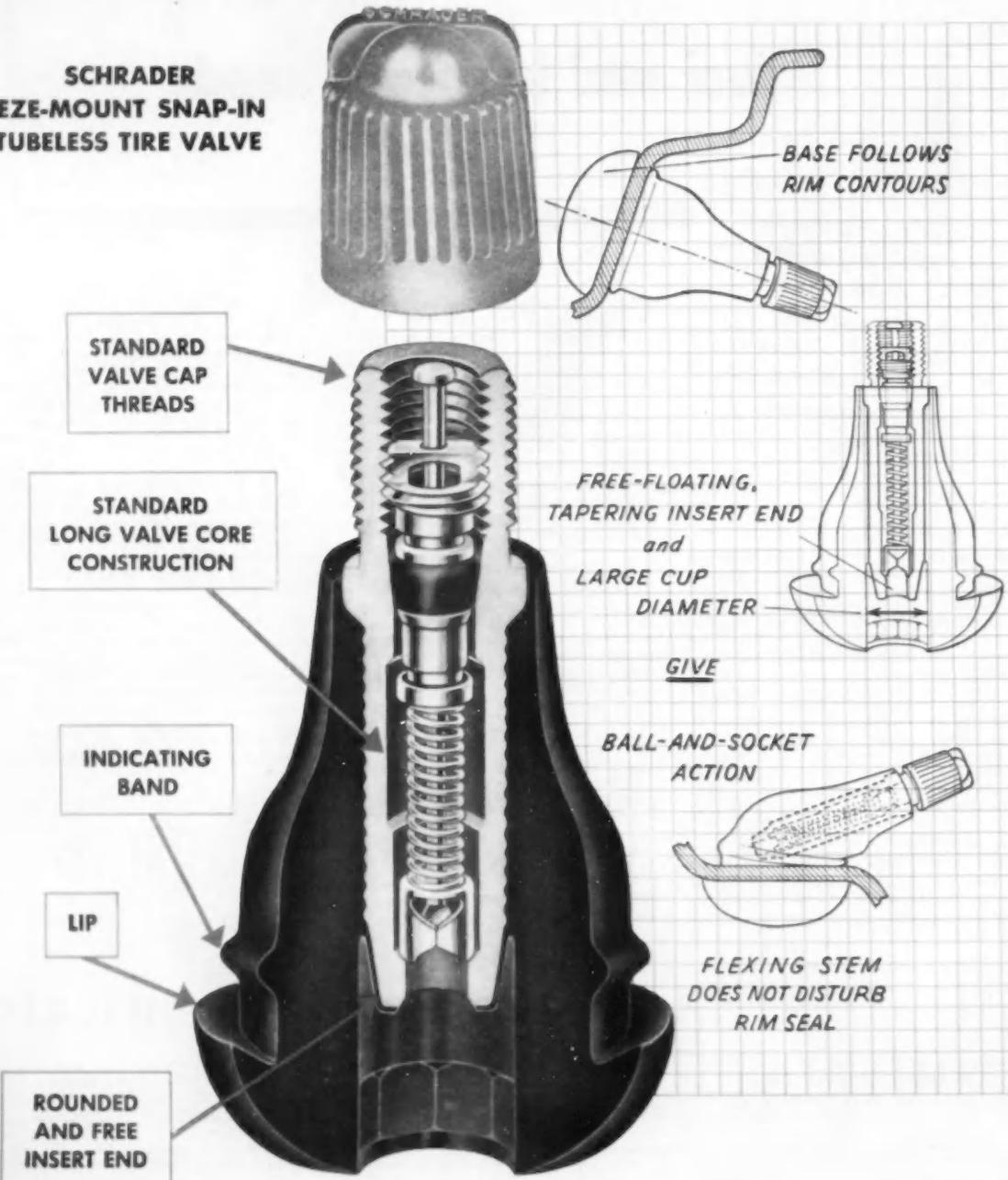
E. I. DU PONT DE NEMOURS & COMPANY (INC.)
Petroleum Chemicals Division • Wilmington 98, Delaware

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TULSA, OKLA.—P. O. Box 730 Phone Tulsa 5-5578
HOUSTON, TEXAS—705 Bank of Commerce Bldg. Phone Blackstone 1151
LOS ANGELES, CALIF.—612 So. Flower St. Phone MADison 5-1491

IN CANADA: Du Pont Company of Canada Limited—Petroleum Chemicals Division, 80 Richmond St. W., Toronto 1, Ont.
OTHER COUNTRIES: Petroleum Chemicals Export—Nemours Building, 6539—Wilmington 98, Delaware

NOW BETTER SCHRADER EZE-MOUNT

SCHRADER
EZE-MOUNT SNAP-IN
TUBELESS TIRE VALVE



THAN EVER! TUBELESS TIRE VALVE

- ★ **EASY INSERTION—EZE-MOUNT** Tubeless Tire Valve is specially designed and shaped so that gradual tapering rubber cover stretches for easy insertion into the rim —then expands for tight seal.
- ★ **SURER, SAFER SEAL**—Full diameter base with special lip, enlarged hole and shortened insert, permit better seal of valve to rim. Lip provides further adjustment to various rim contours.
- ★ **FIELD SERVICE SIMPLIFIED**—Easier-than-ever field service. Special band molded on shank shows when valve is sealed to the rim. Replaceable parts are the same time-saving standard type used since the first automobile.
- ★ **"BALL-AND-SOCKET" ACTION**—When valve is inserted in rim hole, special construction of metal insert, plus enlarged valve base hole, permits "ball-and-socket" flexibility. This keeps base stationary when top of stem protruding from rim hole is distorted by air chuck, gauge, or road hazards.

EZE-MOUNT WORKS WITH THE SCHRADER STANDARD LONG CORE CONSTRUCTION

Talk about design features! Schrader has them all. Look how the EZE-MOUNT Tubeless Tire Valve snaps in . . . to stay! And how it gives greater flexibility . . . stays sealed to the rim when stem is flexed. All this with the famous Schrader "Ace of Standardization" long core principle of Tire Valve construction—time-proved to be the best way to control air in any pneumatic tire.

And important to you, too, aside from providing this valve for Original Equipment on new cars—Schrader provides this same EZE-MOUNT Valve and the mounting tools[®] to make field service fast, easy—economical.

®Brochure upon request.



A. SCHRADER'S SON

Division of Scovill Manufacturing Company, Incorporated
470 Vanderbilt Avenue, Brooklyn 38, New York

Schrader

REG. U. S. PAT. OFF.

FIRST NAME IN TIRE VALVES

FOR ORIGINAL EQUIPMENT AND REPLACEMENT

ON OUR WASHINGTON WIRE



The Government announced that three million lb of nickel previously earmarked for the national defense stockpile will be

permitted to go into industrial uses in the April-June period. The decision was made by Office of Defense Mobilization.

Tool and die makers are protesting another form of Government competition. Too many large prime contractors, they claim, are making their own tools and dies with Government-owned equipment instead of ordering their tools and dies from tool and die producers.

Highest Precision HARDENED & GROUND PARTS

THE ball stud shown here is a perfect example of the precision methods and quality material that go into the production of all Brown Hardened and Ground Parts. Twelve separate operations are employed to produce this vital part. Every feature about this ball stud has to be right—every feature is. It has strength, wear resistance, precision fit, true-ground spherical and tapered surfaces, close inspection and strict uniformity.

Brown Hardened and Ground Parts have been serving the automotive industry for over 40 years. We refer you to any of our long list of satisfied customers. For information pertaining to your own requirements, simply write or wire.

Henry W. Brown
PRESIDENT



THE BROWN CORP.

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SYRACUSE, N.Y.

C. H. Elliott, 5007 Clarendon Rd., Cleveland • N. F. Spring, 4716 Bullard Rd., Detroit • R. C. Sanderson, 5031 N. Ashland Ave., Chicago • Harry J. Windmiller, 1704 Carlton, Fort Worth • Lyle H. Johnson, 1350 Westwood Blvd., Los Angeles, Calif. • John S. Hunt, 9011 S.E. Yamhill St., Portland, Ore.

Summarizing technical information on precision casting of metals is a new, 27-page report (PB 111001R), sold by the Office of Technical Services, U. S. Commerce Dept., Washington 25, D. C. Title of the publication, which sells for 75¢, is **Investment Precision Casting**.

The Administration is expected to maintain a strictly "hands-off" policy with respect to the automobile industry's current talks with the UAW-CIO on the subject of wages and benefits.

Two new Government reports (PB 111533 and PB 111534) tell how to apply tough coatings to titanium and its alloys. They are available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C.; and are priced at 75 cents each.

First automobile industry executive to direct the Automotive Div., Business and Defense Services Administration, is Joseph W. Eskridge. He is on loan to BDSA from his position as vice-president in charge of manufacturing, Hudson Special Products Div., American Motors Corp.

Government officials are opening the door a little wider to admit private industry into the nuclear energy use field. Newly proposed by Atomic Energy Commission are three regulations putting into practical form the provisions of the Atomic Energy Act of 1954.

STROMBERG

CARBUREATORS

Lasting

**Performance in Today's Cars
Will be Tomorrow's
Strongest Selling Point!**

Today, more than ever, new car buyers are looking for features that assure long, satisfactory performance. Engine components that contribute to this accomplishment now assume even greater importance as they not only influence today's sales, but become tomorrow's strongest selling point.

For owner loyalty as well as immediate sales, it pays to specify Stromberg* — the carburetor built for *lasting performance*.

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 **Stromberg® Carburetor**  **Bendix® Electric Fuel Pump**

 **Bendix® Folio-Thru Starter Drive**



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the
right
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Check Standards' Complete Range of tube and pipe sizes!

Whether it's for a pressure, mechanical, sanitary or ornamental use — Standard offers you a convenient "one source" answer to your welded Stainless Steel Tubing need.

**TUBE
SIZES:**
 $\frac{1}{4}$ " to 4" OD
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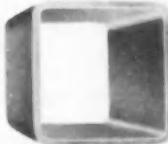


**PIPE
SIZES:**
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Schedule 40



TYPES: 430, 302, 304, 309, 316, 321, 347; and others including low-carbon grades.

SHAPES:
Squares,
Rectangles
and
Special
Shapes



**PIPE
SIZES:**
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Send for Stainless Folder! Our engineers will gladly assist you in your selection of the tube best suited to your needs! Write today!

Specify Standard for

- WELDED STAINLESS TUBING AND PIPE
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- BOILER AND HEAT EXCHANGER TUBING
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Detroit, Michigan
Welded Tubing Fabricated Parts

STANDARD WELD STANDARD - IR Piping



CALENDAR

OF COMING SHOWS AND MEETINGS

British Industries Fair, London and Birmingham, England May 2-13

First International Aircraft Mart Exposition, Will Rogers Memorial Coliseum, Ft. Worth, Tex. May 3-5

Fourth International Aviation Trade Show, 69th Regiment Armory, New York, N. Y. May 4-6

Society of the Plastics Industry, annual meeting and conference, cruise on "Queen of Bermuda,"

May 7-15

Industrial Waste Conference, Purdue Univ., Lafayette, Ind. May 9-11

Metal Powder Association, annual meeting and show, Philadelphia, Pa. May 10-12

Sixth National Materials Handling Exposition, International Amphitheater, Chicago, Ill. May 16-20

AMA Conference on Collective Bargaining, Hotel Commodore, New York, N. Y. May 16-17

Fabricating Machinery Hydraulic Conference, Hotel Statler, Detroit, Mich. May 17-18

National Telemetering Conference, Hotel Morrison, Chicago, Ill. May 18-20

American Society for Quality Control, ninth annual convention, Hotels Statler and New Yorker, New York, N. Y. May 23-25

AMA Top Management Conference, Hotel Roosevelt, New York, N. Y. May 23-25

International Internal Combustion Engine Congress, The Hague, Netherlands May 23-28

Indianapolis Race, Indianapolis, Ind. May 30

Canadian International Trade Fair, Toronto, Ont. May 30-June 10

American Welding Society, spring meeting, Hotel Muehlebach, Kansas City, Mo. June 7-10

Paris Aeronautical Show, France June 10-19

Le Mans 24-Hr Race, France, June 11-12

SAE Golden Anniversary Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. June 12-17

ASME Semi-Annual Meeting, Hotel Statler, Boston, Mass. June 20-23

ASTM Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. June 26-July 1

American Nuclear Society, first annual meeting, Penna. State Univ., State College, Pa. June 27-29

Western Plant Maintenance and Engineering Show, Pan Pacific Auditorium, Los Angeles, Calif. July 12-14

SAE Golden Anniversary West Coast Meeting, Hotel Multnomah, Portland, Ore. Aug. 15-17

NICB Symposium on Electronics and Automatic Production, San Francisco, Calif. Aug. 22-23

Western Electronic Show and Convention, Civic Auditorium and Fairmont Hotel, San Francisco, Calif. Aug. 24-26

National Aircraft Show, International Airport, Phila., Pa. Sept. 3-5

Farnborough Air Show, England Sept. 5-11

Paris Automobile Show, France Sept. 6-16

NMTBA Machine Tool Show, International Amphitheater, Chicago, Ill. Sept. 6-17

Production Engineering Show, Navy Pier, Chicago, Ill. Sept. 6-17

7 WAYS to SAVE MONEY with TOCCO* Induction Hardening



Cost was reduced 94% when heat-treatment of this corn-harvester part was changed from carburizing to TOCCO-hardening. 9½¢ saved on every piece — \$4750 on each 50,000 piece batch, plus an hourly production increase from 120 to 300 pieces per hour.



\$375 per day! When Salisbury Axle switched to TOCCO-hardening axle shafts. Less machining—30 seconds instead of 2 minutes—means lower tool cost. Also production zoomed from 50 to 120 per hour. TOCCO hardened shafts have 200% greater torsional life.



Kearney & Trecker Corp. reduced the cost of hardening this milling machine part from \$1.57 to 10c apiece. In addition TOCCO made possible a switch from alloy to S.A.E. 1045 steel—saving another 11c per piece in material cost. Kearney & Trecker hardens 140 different parts on one TOCCO unit.

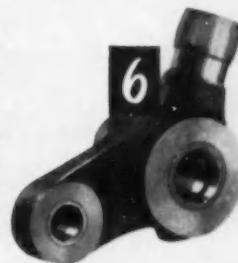


Thompson Products Ltd. boosted production of these automotive wrist pins from 500 to 1200 per hour when they switched to TOCCO-hardening. Costs fell from \$5.45 to \$3.25 per hundred parts—a savings of 2c per pin, \$26.40 per production hour.



Mechanics Universal Joint Division of Borg-Warner reports a 69% savings in the hardening of stub ends for propeller shafts. TOCCO also upped production from 35 to 112 parts per hour—over three times as fast as conventional heating methods.

Lima-Hamilton Corporation adopted TOCCO for hardening this shifting lever. Results: a savings of 4c per piece—\$25 per production hour. TOCCO costs only 17% of former heating method. This is only 1 of 139 parts TOCCO-hardened by Lima-Hamilton Corp. All show savings over usual heating methods.



Number 7—the lucky number—is up to you. Why not add your name to the list of companies who use TOCCO Induction Heating to increase production, improve products and lower costs. TOCCO engineers are ready to survey your plant for similar cost-saving results—without obligation, of course.

THE OHIO CRANKSHAFT COMPANY



NEW FREE
BULLETIN

THE OHIO CRANKSHAFT CO.

Dept. H-5, Cleveland 1, Ohio

Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating."

Name _____

Position _____

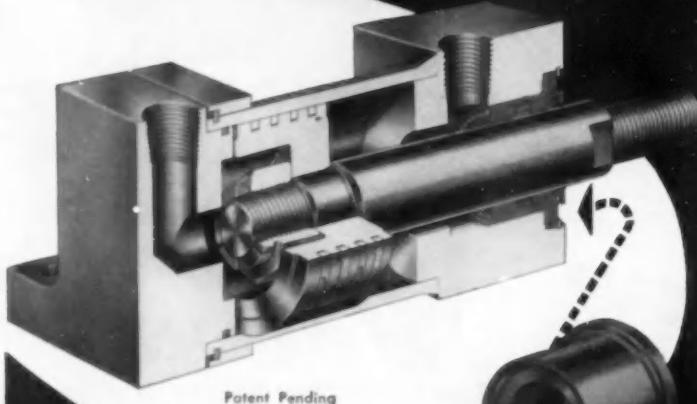
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High Pressure HYDRAULIC CYLINDERS



*Cut downtime
with "quick-change"
rod packing cartridge*

- 2,000 P.S.I.
- J. I. C. STANDARDS
- COMPACT DESIGN
- OPTIONAL ROD SIZES
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- 11 TYPES OF MOUNTINGS
- 11 BORE SIZES— $1\frac{1}{2}$ " TO 8"
- UP-TO-DATE ENGINEERING



The S-P "quick-change" packing cartridge is easily removed for servicing seal or wiper. *Cuts downtime . . . speeds*

production. S-P Hydraulic Cylinders have every modern design feature. Representatives in principal cities. Prompt deliveries. Send for Catalog 104. The S-P Manufacturing Corp., 12415 Euclid Ave., Cleveland 6, Ohio.



**THE S-P MFG. CORP. — Cleveland
A Bassett Company**

PRECISION PRODUCTS SINCE 1916

AIR AND HYDRAULIC CYLINDERS • POWER CHUCKS • ROTATING AIR CYLINDERS
COLLET AND DRILL PRESS CHUCKS • AIR PISTONS, VALVES AND ACCESSORIES

SHORTIES

All government—Federal, state and local—will collect about \$90 billion in taxes in 1955.

It takes a \$4500-a-year man two hours and 35 minutes of his eight-hour work day to earn enough to pay for taxes. He works only one hour and 37 minutes to pay for food for his family; one hour and 24 minutes for housing costs; 36 minutes for clothing; and 42 minutes for transportation.

In 1908, the hourly income of a tire plant worker would pay for 23 miles wear on an automobile tire. Today it would pay for 3850 miles wear.

Two-thirds of all motor vehicles are shipped from factories to buyers over the highway. The remaining third go by rail and boat.

The design of a modern multi-jet bomber required more than 76 times as much wind-tunnel research as the design of a typical World War II bomber.

More than 1.7 million drivers ran out of gas, and there were 11.6 million cases of tire trouble in 1954.

Home-town advertising cost the 40,000 U. S. new car dealers more than \$228 million in 1954. This amount works out to an average of \$41.21 per new car.

The average lifetime of motor vehicles has doubled and their average lifetime mileage has tripled since 1930. Cars and trucks scrapped today average 14.3 years, with a mileage of 125,000.

More than a third of all radios built in the U. S. in 1953 were designed for automotive use.



Better Things for Better Living
Through Chemistry

AUTOMOTIVE ENGINEERING

NEWS

PROPERTY AND APPLICATION DATA ON THESE
VERSATILE ENGINEERING MATERIALS: "ZYTEL,"
"ALATHON," "TEFLON," "LUCITE."

NO. 4

1955

Clutch Lever Assembly Bushing of TEFLON® Successfully Completes 300,000 Cycle Test



The 1955 Mercury clutch lever assembly uses a .014"-thick, wrap-around bushing made of Du Pont "Teflon" tetrafluoroethylene resin.



bushing of "Teflon" outperformed bronze in this application, and provided a savings of 2¢ per unit in addition.

Lincoln-Mercury design engineers save 2¢ per unit with bushing of "Teflon"

The use of a clutch lever assembly bushing of Du Pont "Teflon" tetrafluoroethylene resin has solved two problems for Lincoln-Mercury designers, and provided a savings of 2¢ per unit in addition.

Original thinking was to use a bronze bushing, and lubricate this through a grease fitting. However, the bushing was located near the exhaust pipe; heat might affect the lubricant. The second problem was that all possible locations for the grease fitting were so difficult to reach that lubrication would be almost impossible.

Lincoln-Mercury engineers tested a wrap-around bushing of Du Pont "Teflon" (see cut). The .014"-thick bushing satisfactorily completed a 300,000 cycle test—the equivalent of ten years' operation. During this test, the bushings of "Teflon" tetrafluoroethylene resin were subjected to water, dust and oil.

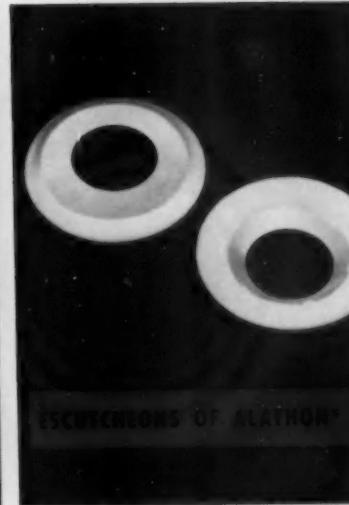
Better Performance at Less Cost

The experiment was judged a complete success. Not only does the bushing of "Teflon" resist wear better than the bronze bearing in this application; it also cuts costs by eliminating the grease fitting, its drilled and tapped hole, and another drilled hole in the clutch lever shaft. Use the coupon on the other side of this page for more information about "Teflon" tetrafluoroethylene resin.

"Zytel" is the new trade-mark for Du Pont nylon resin.



Cable clamps must be able to take it. These clamps of "Zytel" nylon resin have excellent flexural strength for long service life. Their molded edges won't cut or fray the cable insulation and cause short circuits. "Zytel" is lightweight, and chemically inert to gasolines. (Clamps molded for Burndy Engineering Company, Inc., Norwalk, Connecticut by Atlantic Plastics, Inc., Stamford, Conn.)



"Polyflanges" attractive semi-rigid escutcheon molded of Du Pont "Alathon" polyethylene resin are replacing metal and rubber counterparts in many appliance applications. Eye-appealing, swift to apply and snug fitting to radii account for their success. "Polyflanges" are low in cost. (Manufactured by Falcon Plastic Products Manufacturing Company, Culver City, California.)

OVER



DuPont
Basic Fibers for Better Living
DuPont Chemicals

AUTOMOTIVE ENGINEERING NEWS

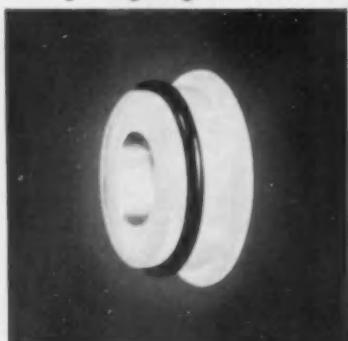
PROPERTY AND APPLICATION DATA ON THESE
VERSATILE ENGINEERING MATERIALS: "ZYTEL,"
"ALATHON," "TEFLON," "LUCITE."

NO. 4

1955

Rollers of "Zytel" help cut noise 72%; resist wear

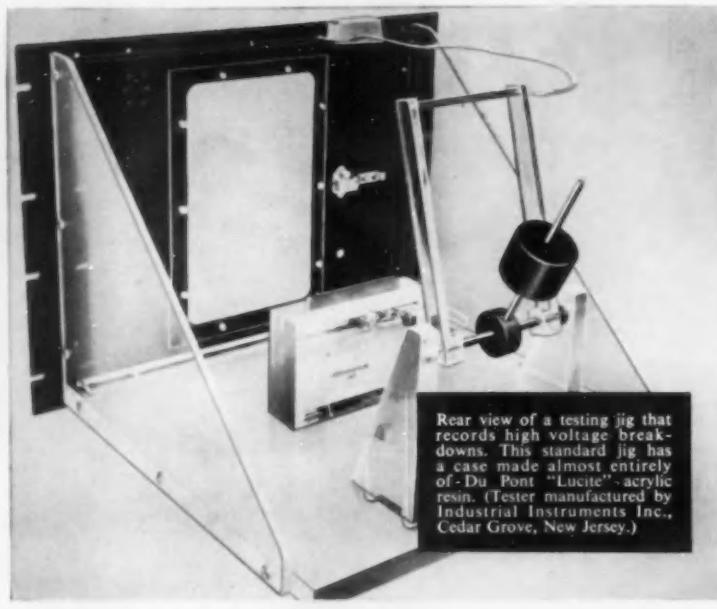
Noise and how to reduce it continues to challenge design engineers. One desk



Desk-drawer roller is injection-molded of Du Pont "Zytel" nylon resin. The unique combination of properties of "Zytel" enables this roller to operate quietly, smoothly. "Zytel" is also extremely durable. (Molded for the Corry-Jamestown Manufacturing Corporation, Corry, Pennsylvania by Quinn-Berry Corporation, Erie, Pennsylvania.)

manufacturer solved this problem with an exceptionally quiet roller of Du Pont "Zytel" nylon resin.

He once used ball bearings and metal rollers in the drawers. But after a series of tests, his engineers found that a roller of "Zytel" with a synthetic rubber ring not only reduces noise by as much as



Rear view of a testing jig that records high voltage breakdowns. This standard jig has a case made almost entirely of DuPont "Lucite" acrylic resin. (Tester manufactured by Industrial Instruments Inc., Cedar Grove, New Jersey.)

72% but has other significant advantages. There is no sacrifice of durability—"Zytel" is extremely tough. And even under heavy loads and operating on dusty, grimy surfaces, the rollers of "Zytel" move smoothly and easily.

Investigate DuPont engineering materials in your product development programs

One of the family of these versatile engineering materials is often a key factor in product improvement or new product design.

The wide range of properties available with "Alathon"® polyethylene resin, "Lucite"® acrylic resin, "Teflon"® tetrafluoroethylene resin, and "Zytel"™ nylon

resin are helping solve industrial design problems.

NEED MORE INFORMATION?

Clip the coupon for additional data on the properties and applications of these DuPont engineering materials.

Testing Jig of DuPont LUCITE® is Used to Study High Voltage Breakdowns

The standard testing jig (rear view) pictured above measures voltage breakdowns for sheets, strips or tape. It is designed to provide both industry and the laboratory with a safe, dependable source of 60-cycle variable high voltage.

Conforming to ASTM Specification D-149-44, the tester has a synchronous drive so that voltage applied to the test piece may be automatically increased at a constant rate—500 to 1000 volts per second until breakdown occurs.

Because of the characteristics of high voltages, the manufacturer of this testing jig has encased the test chamber with DuPont "Lucite" acrylic resin. "Lucite" permits maximum versatility of testing jig setups, while resisting the high voltages that are developed in the tests.

All automotive engineers are naturally aware of the decorative properties of DuPont "Lucite." However, this engineering material has mechanical and electrical properties which are equally adaptable for new, more efficient designs. Clip the coupon on this page for complete information on "Lucite."

E. I. DU PONT DE NEMOURS & CO. (Inc.) POLYCHEMICALS DEPARTMENT

Room 175, DuPont Building, Wilmington 98, Delaware

In Canada: DuPont Company of Canada, Ltd., P. O. Box 660, Montreal, Quebec

Please send me more information on the DuPont engineering materials checked:
 "Zytel"; "Alathon"; "Teflon"; "Lucite". I am interested in evaluating these materials for:

NAME _____

POSITION _____

COMPANY _____

STREET _____

STATE _____

CITY _____

TYPE OF BUSINESS _____

*"Alathon", "Lucite", "Teflon" are registered trade-marks of E. I. duPont de Nemours & Co. (Inc.)
†"Zytel" is the new trade-mark for DuPont nylon resin.

Free LITERATURE

(Continued from page 90)

Standards 23

A List of American Standards—1955 edition—lists and indexes about 1500 American Standards. *American Standards Association.*

Ceramics 24

A four-page bulletin on Nicote, its metallized ceramic coating to which a metal part or other metallized ceramic part may be soldered without special preparation, is available. Bulletin 155. *Frenchtown Porcelain Co.*

Diesel Engines 25

Fageol-Leyland Diesel engines, horizontal and vertical models of both the 600 and 680-cu in., are described in detail in bulletin L-6841. *Twin Coach Co.*

Hydraulic Standards 26

A revised issue of the Joint Industry Conference hydraulic standards for industrial equipment is now available, including the recommended practices on hydraulic packings and seals, examples of packing code identification, sample circuit using J.I.C. symbols, glossary of terms and other useful information. *Miller Fluid Power Co.*

D-C Motors 27

New 12-page illustrated bulletin describes the Super 'T' Line d-c motors with Dynamic Response, the name given to the requirement of fast response to the demand for change as in conveyor drives. Information is included on speed ranges, acceleration rates, enclosures, dimensions, and selection data. *Reliance Electric & Engineering Co.*

Hose Assemblies 28

A catalog of industrial hose assemblies, couplings, stems, swivels and accessories has been released, covering both permanent and reusable couplings. Catalog No. 55, 24 pages. *J. N. Fauver Co.*

(Turn to page 132, please)

AMAZING ACCURACY

ELIMINATES MISFEEDING

INCREASES PRODUCTION

GRIPPER FEED

SCUFF-FREE FEEDING

FAST DELIVERY

You can feed stock up to 3/16" thick; any width 1" to 36"; feed from the left, right, front or back—and, you can adjust the stroke up to 36". Installation and adjustments are quick and simple. Unit is easily moved from one press to another.

COMBINATION CRADLE AND STRAIGHTENER



For Straightener Unit, a positive aligning wedge mechanism is used to adjust rolls. Straightens stock up to 3/16" thick; on rolls that are hardened, ground, and power driven. Power driven rolls or slat conveyor, cradles stock. Loop control arm regulates flow.

Write for detailed Catalog Sheets

SPECIAL EQUIPMENT and SALES COMPANY

3949 E. Nine Mile Rd. • Hazel Park, Mich.

manufacturers
of press room
equipment

METALS

(Continued from page 96)

Copper Price Advanced

The domestic copper price was advanced to 36 cents per lb on April 1 by Phelps Dodge Corp. and the increase was followed by Anaconda and Kennecott. The latter delayed several days before advancing its price and executives of the country's largest copper producer expressed reluctance to follow along. But two prices for copper are unthinkable.

The new price comes close to being the highest level at which the metal has ever sold in the U. S. The immediate cause for the advance was furnished as usual by action of the Chilean Government which demanded a price for its metal in the U. S. more in keeping with the sky-high level of 45 cents per lb paid in Europe. With domestic demand for copper exceeding combined primary and secondary production, imports were needed to balance. Threatened with the loss of imports from Chile, the domestic price had to be raised.

London Price Breaks

It was perfectly obvious to intelligent observers that the 45-cent price abroad could not hold after ending of the temporary squeeze that resulted from the Rhodesian strike. The collapse came suddenly in mid-April, when the London price broke £28 per long ton in a single day. This brought the price down to the equivalent of 37½ cents per lb. It was promoted by an announcement from the British Government that it would release 45,000 tons to U. K. consumers for delivery over 1955 to ease the shortage. It is significant that the Government's action was welcomed by producers and consumers alike—the chairman of the largest Rhodesian producer declared the price had been ridiculously high.

The domestic price of 36 cents was unaffected by the London break. However, scrap prices were reduced to a more realistic level in our markets.

March statistics from the Copper Institute showed crude production in U. S. at nearly 99,000 tons for the month, highest since the war. Foreign output snapped back to the level before the Rhodesian work stoppage. Refined stocks both here and abroad were moderately higher. The conclusion seems justified that the supply situation has definitely improved and that by mid-summer easier conditions will prevail.

Zinc Price Advanced

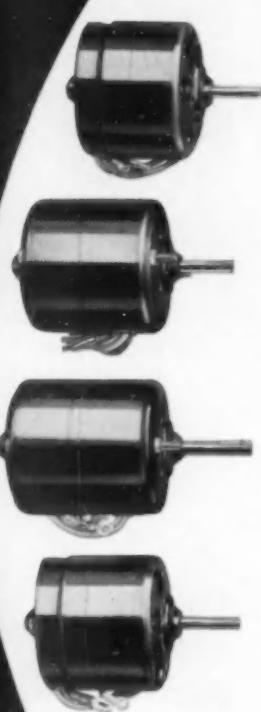
The long-awaited price advance in zinc took place early in April, a modest $\frac{1}{2}\%$ increase that brought it to 12¢ per lb. The zinc statistics for March were somewhat disappointing. Production of slab continued very high, with daily output averaging 2877 tons, a new record. Stocks of slab showed only a relatively small decrease to 90,837 tons. The Government took nearly 13,000 tons for the stockpile during the month. Total shipments were 94,500 tons.

If it had not been for Government purchases, production would again have exceeded domestic shipments. If stockpiling buying closes at the end of June as called for (although it is strongly hinted it will be continued) and there were no reduction in output, the price could hardly be held at its present level.

It is recognized that the Government expects to pay not more than a combined price of 27¢ per lb for lead and zinc. Hence, any price increase in either metal that would bring the combined price above 27¢

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VOLUME

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• DEFROSTERS • SEAT ADJUSTERS
• AIR CONDITIONERS • CAR COOLERS
• PUMPS • WINDOW REGULATORS
• MARINE VENTILATORS



Leece-Neville Small Motors are produced for automotive use in 6 volt to 32 volt systems. Higher voltage motors are available for other applications. For full information, write The Leece-Neville Company, Fractional H. P. Motors Division, Cleveland 13, Ohio.

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RELY ON

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Neville
AUTOMOTIVE ELECTRICAL EQUIPMENT
SINCE 1909

could well result in a cessation of purchases from Washington, which might result in a speedy downward adjustment in price.

Demand is good for Prime Western and especially good for Special High Grade from the diecasters. However, the latter are dependent for most of their business from the automobile industry. It appears unlikely that the pace can continue unabated in Detroit and any slowdown would affect demand from the diecasters.

Lead Steady

Lead is in a better position than zinc statistically, and virtually all branches of the lead-consuming industries are in the market for good tonnages. Shipments of automotive replacement batteries are ahead of corresponding months of 1954. The price remains firm at 15¢ per lb.

Titanium Reduced in Price

Titanium sponge metal was reduced in price by 55¢ per lb on April 1 by the Titanium Metals Corp. The cut was quickly followed by DuPont. This brings the new price to \$3.95 per lb for sponge and compares with \$5 last year before DuPont reduced it to \$4.50. The reduction was the largest single markdown for the last five years.

New Disk-Type Wheel Brakes

(Continued from page 61)

recommended as being desirable.

A single lever mechanical emergency brake is incorporated in the rear brake assemblies. The lever is attached to both primary and secondary actuating disks with pins tapered in opposite directions. As the linings wear and the disks move further apart, the lever maintains the same original position, which makes it self-adjusting. Movement of the lever rotates one disk with respect to the other, causing the balls to roll up the ramps and energize in either the forward or reverse direction.

Tracing the sequence of braking action, pedal movement sends hydraulic fluid into the chamber of the annular piston assembly, sealed by the O-ring. The O-ring moves out, pushing the annular piston ahead of it which forces the two actuating disks apart. The brake lining on the disks then contacts the friction sur-

face on the housings. The primary actuating disk "clocks" or rotates with respect to the secondary actuating disk, which causes the balls to roll up the inclined seats. This forces the actuating disks farther apart, creating an additional normal force applied at the braking surface.

Since the ball seats are inclined plane surfaces and the balls follow a straight line path, the energizing force supplied by the action of the balls is always directly proportional to line pressure. This presupposes that the lining coefficient of friction is constant, which it substantially is,

as a result of the heat dissipation qualities of the brake. The result is then controlled self-energizing.

The curves shown in the figure indicate the results of fade tests run by a car manufacturer on an 11 in. drum brake and on the Double Disk brake. The tests were both run on a car weighing 4800 lb, at 60 mph, decelerating at 15 ft/sec/sec with 0.4 mile intervals between stops. Line pressure was recorded at the beginning and end of each stop. The respective line pressures were converted to pedal effort for comparative purposes on the curves.

Now **EVERY** Fleet
in America can afford
Leece-Neville
Alternators

SENSATIONAL LOW PRICE ON
NEW L-N ALTERNATOR SYSTEM

The new Leece-Neville Alternator brings to fleets of passenger cars, light and medium trucks all the famous advantages that larger L-N Alternators have proved by performance for over nine years: charging current with engine idling, high output, low maintenance cost. Plus new, simplified bracketing. Yet the new L-N Alternator System actually costs less than "extra" output d. c. generators.

L-N ALTERNATORS FOR EVERY APPLICATION

There's a right L-N Alternator for every fleet unit. Capacities range from 60 amps for 6-volt systems to 180 amps for 12 volt. L-N Alternators will keep your fleet on the job and out of the repair shop. Why not get the whole story? Just write The Leece-Neville Company, Cleveland 14, Ohio. *Distributors in principal cities . . . service stations everywhere.*

ON YOUR NEW UNITS SPECIFY LEECE-NEVILLE EQUIPMENT.
FACTORY-INSTALLED

**YOU CAN
RELY ON**

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Neville**

ALTERNATOR SYSTEMS • GENERATORS
STARTING MOTORS • REGULATORS • SWITCHES
FRACTIONAL HP MOTORS

TRUCK
PASSENGER
BUS
RAILROAD
DIESEL
MARINE
INDUSTRIAL
OFF-HIGHWAY



ENGINEERING
REPORTS:

CONSTANT CUTTING SPEED as well as quick acceleration, deceleration and reversals give General Electric Speed Variators wide application on machine tools such as this lathe.



G-E SYSTEM-ENGINEERED . . .

J.I.C. Speed Variator gives stepless

Designed specifically for the automotive industry, G.E.'s J.I.C. Speed Variator is system-engineered to meet Joint Industry Conference electrical standards. It provides highly efficient operation over wide speed ranges from 8-to-1, up to 50-to-1, without intermediate speed-changing equipment. Each unit is a complete adjustable-speed system—factory-assembled and tested, ready to install and operate. You get a packaged all-electric drive operating from a-c power.

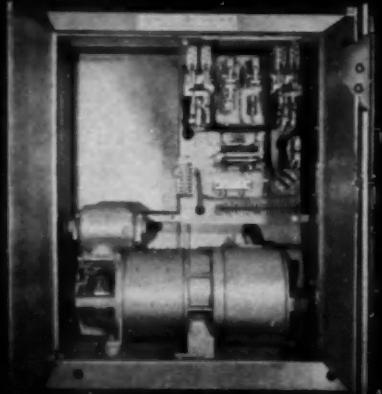
Components include a d-c motor, operator's control station, and a power unit cabinet which houses a motor-generator set and all necessary control.

Standard optional features include dynamic braking;

reversing and dynamic braking; reversing, jogging and dynamic braking; electronic regulators; various d-c drive motors such as dripproof, splashproof, totally enclosed fan-cooled, and totally enclosed unit-cooled. Practically any speed range desired can be obtained, and, in addition to standard units, G-E engineers will tailor units to your particular application.

G-E Speed Variators are widely applicable in the automotive industry on machine tools such as lathes, grinders, milling machines, broaches, slotters, boring mills, as well as on testing stands and conveyor systems. Bulletins GEA-6000 and GEA-6127.

GENERAL **ELECTRIC**



POWER UNIT



D-C MOTOR



OPERATOR'S PANEL

POWER UNIT of G.E.'s Speed Variator has space for additional control. System components are factory-packaged and tested to cut installation time and cost.



"**PACKAGED**" POWER UNIT contains all conversion and control equipment. Installs in any reasonably level floor space—no foundation needed.



ADDED SAFETY of interlocked, gasketed doors, and lockable disconnect switch helps protect personnel. Doors cannot be opened with power on.

adjustable speed, precise control

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Please send the following bulletins:

For reference only For an immediate project

GEA-6127, 1-200 hp Speed Variators

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New Cataloging Plan Provides Practical Short-Cuts
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The Right Pump for the Purpose

If Your
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Call For...

a COOLANT PUMP that
provides positive delivery,
is self-priming and operates
under high suction lift . . .

In capacities from 2 to 50 g.p.m.

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Tuthill Catalog

104



Catalog 104 presents the Model M series of rotary, internal-gear positive displacement pumps with the exclusive Tuthill automatic internal-relieving feature for controlled pressure.

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Canadian Affiliate: Ingersoll Machine & Tool Co., Ltd. • Ingersoll, Ontario, Canada

Free LITERATURE

(Continued from page 127)

O-Rings

29

Facilities and commercial O-Rings, MS 29512 fuel-resistant O-Rings, MS 29513, fuel resistant O-Rings, formerly the series AF 934, AN 6227B and AN 6230B aircraft quality O-Rings, AMS 7270 fuel-resistant O-Rings, and AMS 7274A oil-resistant O-Rings are described in a new catalog. *Stillman Rubber Co.*

Cartridge Air Valves

30

Cartridge air valves, solenoid operated, palm poppet operated, and lever poppet operated, are explained and specified in four-page bulletin V-150. *Carter Controls, Inc.*

Air Valves

31

A 66-page catalog illustrating its entire line of two-way, three-way and four-way air control valves for high-pressure or low-pressure installations includes: cam flow control, foot, hand, interlocking, pilot, pressure regulator, quick exhaust, sequence, solenoid and time delay. Also presented are single and double-acting cylinders for air or hydraulic use. *Airmatic Valve, Inc.*

Disk Grinders

32

A new catalog detailing a line of double horizontal disk grinders contains application and construction information on sizes ranging from three to 50 hp, which use disk wheels ranging from 12 to 72 in. in diameter. Bulletin No. 200, 16 pages. *Besly-Welles Corp., Grinder Div.*

Carbide Inserts

33

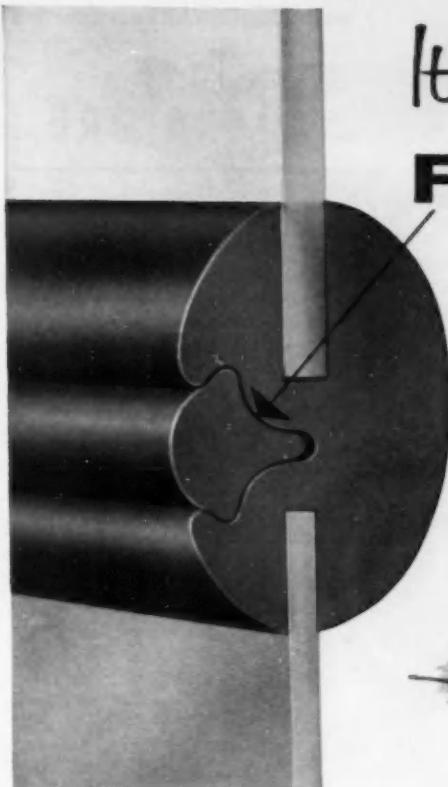
Advantages and mechanical features of the new Multicut series of holders for "throw-away" carbide inserts are described and illustrated in bulletin No. 552-M available from *Wesson Co.*

Custom Forging

34

Facilities for producing forgings to customer's specifications, nomen-

(Turn to page 134, please)



It's this separate **FILLER STRIP**

that puts more pressure on the fence and the glass... providing
a permanent leak proof seal!



The filler strip makes possible these
other Inland advantages!

If you're having trouble with windows and windshields that only slow up the rain, then you've probably looked longingly at a competitor's model and asked yourself . . . "how do they do it?" At first glance, their seals seem no different from your own . . . and yet—look closely. See that filler strip? That means they're using Inland's new self-sealing weather strip. No wonder they have no leak problems.

The installer compresses the strip *after* the glass is in place. No more forcing the glass into a groove. What's more, Inland weather strip is, by far, the easiest to install!

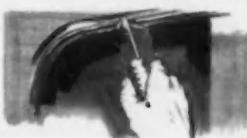
INLAND MANUFACTURING DIVISION
General Motors Corporation • Dayton, Ohio



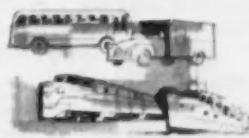
FREEDOM OF DESIGN! No provision need be made for moldings, channels, binder strips or cement when designing with Inland Self-Sealing Weather Strip.



EASY GLASS REPLACEMENT! Less lost time for vehicles. A one-man job, broken glass can be replaced on the road, if necessary.



A POSITIVE SEAL! This filler strip puts more pressure on the fence and the glass—assures complete, positive weather proofing every time.



VERSATILITY! Ideal for vehicles, booths, trains, gasoline pumps, buildings, marine windows—for positive, permanent sealing of any window or panel!

Self-Sealing
(PATENTED)
WEATHER STRIP

(Advertisement)

GASOLINE or DIESEL?

Hercules engineers will assist you in the proper selection of the most economical type of engine for your particular equipment.

Many of our customers have asked us, "Which type of engine would be best for me?" Perhaps this same question has entered your mind at one time or another.

Of course, there are many governing factors which should be considered in selecting the proper type of engine for a particular piece of equipment. First of all, how much horsepower is needed? Is there a special type of fuel which costs less locally . . . natural gas, L.P. Gas, kerosene or crude oil? How much money will be involved in the initial purchase? How much money can you expect to save by using a low-cost fuel? Will it be enough to offset the extra cost of a special type of engine? These and many other questions should be objectively answered before any engine is purchased.

We have no particular cause to champion and do not attempt to take sides or promote the use of one fuel over the other. As you know, we manufacture all types of internal combustion engines to operate on any fuel that is readily available. (Natural gas, L.P. Gas, kerosene, diesel fuel, gasoline, crude oil, etc.)

The basic Hercules gasoline engines are adapted by minor changes to operate on different spark-ignition fuels. The Hercules diesel engines are compression ignited — specifically designed for operation on diesel fuel.

We have, however, maintained several similarities between the Hercules spark-ignited and the Hercules diesel engines which we think are very important. First of all, gasoline and diesel engines of comparable piston displacement have similar mounting dimensions and operating charac-

teristics. Generally speaking, this makes it possible for equipment to be powered by either Hercules gasoline or diesel engines without creating any major installation problems. Thus, equipment manufacturers are able to supply customers with the proper type of engine to assure "top-notch" economies, according to the customers' operating conditions.

Another similarity between our gasoline and diesel engines, is that they both are of the 4-cycle design. The 4-cycle design is universally accepted and understood. This feature provides for less complicated engine servicing and in addition, service is readily available throughout the country.

What does all this mean to you? Maybe we can sum it up in our motto, "Engine Manufacturing Specialists Since 1915". Actually, we're custom engine builders with manufacturing facilities. Our engineering and sales policy is to design and sell engines to meet the exacting needs of our customers.

As a result, we have 70 basic models of gasoline and diesel engines which range from 3 to 500 H.P. They are available in many different designs . . . vertical and horizontal engines, special fuel handling equipment, various types of flywheels, etc. . . . in fact, we probably have an engine that will fit your particular needs to a "T".

Whether it's Agricultural, Oil Field, Automotive, Construction, Industrial, Marine or any other engine application, our engineers will gladly assist you in the proper selection of power for your equipment. Give us the details, so that we understand your problem, and we'll provide the answers to your power problems.



HERCULES ENGINES

HERCULES MOTORS CORPORATION

103 Eleventh Street, S. E. • Canton, Ohio

Free LITERATURE

(Continued from page 132)

clature, design layout, die design, tolerance tables, etc., are shown in a 20 page brochure. *Consolidated Industries, Inc.*

Precision Shop 35

Skilled toolmakers at work are shown in a 24-page brochure spotlighting examples of fine die and gage making work. *Ehrhardt Tool and Machine Co.*

Large Lathe

Series 90 Dyna-Shift heavy duty lathe, Models 2500, 2501 and 2502, are designed specifically to permit carbide tooling to be used to the fullest advantage on work of considerable size. The new machine is discussed in detail in 26-page bulletin No. 1601 available upon letterhead request to the *Monarch Machine Tool Co., Sidney, Ohio*.

Bar Feed

A.M.L. pneumatic bar feed, by keeping pace with time, feeds bar stock continuously into single spindle screw machines, turret lathes, centerless grinders, abrasive-wheel cut-offs, punch presses, cold headers, die machines and other equipment for periods up to eight hours. Address requests for 24-page booklet on company letterhead to *Lipe-Rollway Corp., Bar Feed Div., Syracuse 1, New York*.

Three New Spring Colors Are Offered On Ford Cars

Spring once again brings a galaxy of gay new colors on automobiles. In addition to the multitude of color combinations already offered on its 1955 cars, Ford is making available three new hues, which can be combined with present colors when two-toning is desired.

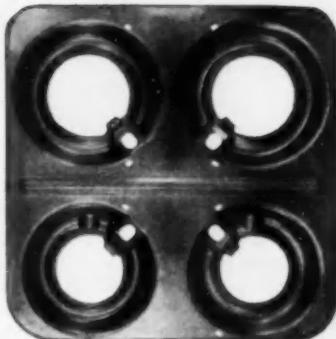
The new colors are Coral Mist, Mountain Green, and Regatta Blue. The addition of the new colors brings to 14 the number of solid body paints and 37 two-tone combinations now offered on Ford cars.



Plastic Low Cost Tooling

For

Dies... Drill, Welding, and Assembly Jigs



Vulcan, keeping pace with modern tooling, can recommend plastic tooling for medium production on numerous tool programs.

Plastic tools are light in weight, have good impact, compressive strength and dimensional stability. No hand finishing of parts required as galling or marking is eliminated by using plastic form dies.

Contours and odd shapes are cast or laminated to suit individual tools, saving expensive machine and hand finishing operations.

Plastic tools, built in a matter of days instead of weeks, lower your tool costs for those medium production runs.

Our actual production figures prove plastic has a definite place in modern production.

Vulcan Tool Company's organization, building fine tools since 1916, believes new tooling developments must be proved by tool engineers. Since plastic is not a cure-all your problem should be handled by recognized, practical tool men.

Our engineering staff will recommend the correct plastic material and advise if parts of your tooling program should be in plastic.

Send a part print and your production requirements for quotation and recommendations.

Major Vulcan Services . . . Engineering, Processing, Designing and Building . . . Special Tools . . . Dies . . . Special Machines . . . Vulcamatic Transfer Machines . . . Automation . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and size. Vulcanaire Jig Grinders . . . Motorized Rotary Tables . . . Plastic Tooling.

VULCAN TOOL CO....PLASTIC TOOL DIVISION

743 Lorain Ave., Dayton 10, Ohio

OBSERVATIONS

(Continued from page 94)

of increasing engine horsepower by 100 per cent or more, with important gains in fuel economy as well. When superimposed on two-cycle Diesel engines having their own blower, this turbocharger provides the same kind of gains as on the four-stroke engine. It occurs to this writer that this type of turbocharger could conceivably change the passenger car engine picture materially. For example, it should

be feasible to build a high performance engine of small displacement—say only 100 cu in.—and yet develop as much horsepower at the top end as do the largest displacement engines now on the market.

Vetoes Pickling

Pangborn—the shot-blasting and shot-peening experts—have a new one going into service soon in the Detroit area. It's the de-scaling of sheet and strip and plate with automated equip-

ment of unique design. It is intended to make practical the utilization of hot rolled material—where this can be employed—by preparing the surface with shot blasting. Considerable economy is claimed for the process in the use of relatively less expensive hot rolled steel; the elimination of pickling. A number of installations should be in use in automotive plants within the next three or four months.

Tracer Lathes

Automatic tracer-operated lathes have come a long way in recent years. They are extremely useful in turning stepped shafting from a master template; and are capable of very high rates of metal removal. Fairfield Mfg. Co., a major producer of gearing, particularly large gears, recently installed two big Sundstrand lathes with tracer control, possibly the first example of such equipment from Sundstrand. They are used for turning long shaft drive pinions, one of these requiring removal of $1\frac{1}{4}$ in. of metal at the stem end. Cutting is done with a single-point carbide tool at 600 sfpm, feed of 0.018 in. per revolution. Floor-to-floor time for these large shafts is only three minutes.

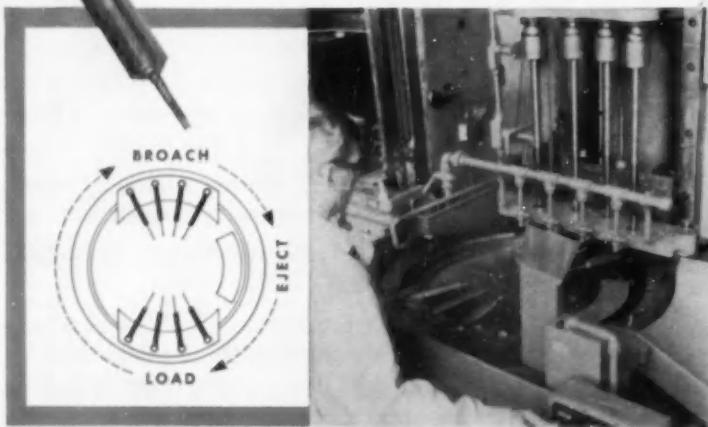
Recording Automation

To this publication the acceleration of automation progress is nothing new. We have watched and recorded its development for about 20 years. Readers will be amazed to find the amount of material published in AI on this subject. It would be quite a project to collect all the articles that have appeared during this interval since even current material would fill volumes. What we should like to emphasize is that if there is anything new in automation, you will find it in AI or we can show you where it is.

Tubeless Tires

Just as predicted, tubeless tires have become available for heavy duty trucks and off-highway vehicles. Good-year made this announcement recently, together with news of the availability of special rims and seals. Tubeless tires in smaller sizes were made standard equipment on light vehicles on the 1955 truck lines announced recently. It is only a matter of time before tubeless tires will be used across the board in trucks as they are in passenger cars.

RADIAL FIXTURE DESIGN



contributes to HIGH OUTPUT BROACHING the American way

While this American vertical pull-down broaching machine is broaching the inside diameter of four shock absorber yokes, the operator loads the opposite four radial stations of a rotating base fixture. At the end of the broaching stroke, the fixture indexes 90° and automatically ejects the parts down a chute. Fixture then rotates another 90° for loading while the second broaching cycle is begun.

Operation is push-button controlled — output over 1100 pieces per hour.

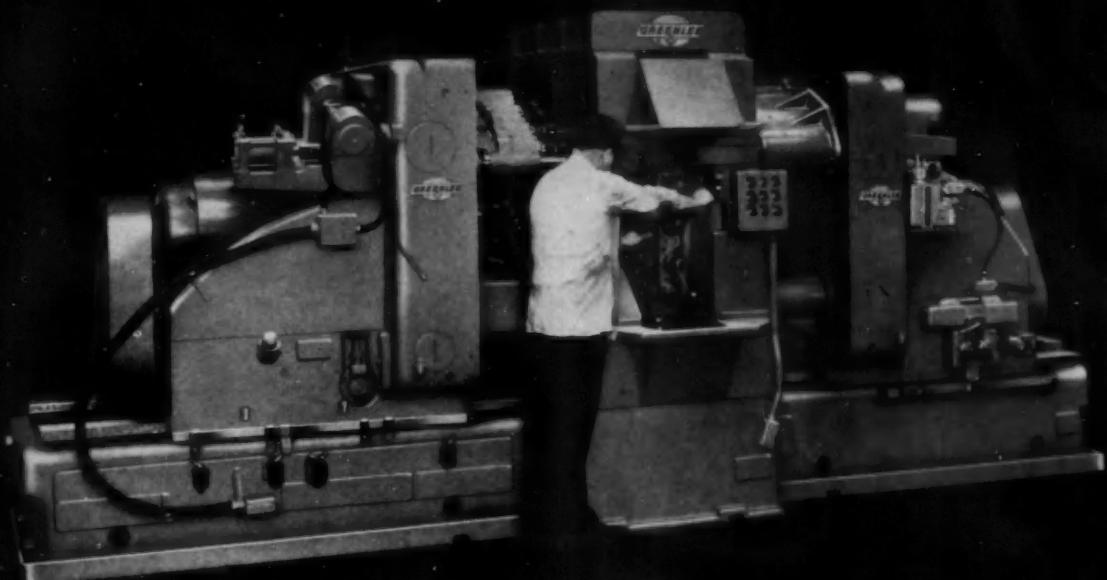
Unusual tooling to meet specialized production requirements is constantly being developed through creative engineering at American. Whether your broaching problem requires the best in automatic or automated control, or simply an economical adaptation of a standard machine, you will gain by referring your requirements to American. American has been making broaches, fixtures and broaching machines — all three — for over 35 years. To put this experience to work for you, send a blue print or sample part. An American recommendation will be furnished promptly.

Ask for Catalog No. 450.

American BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery





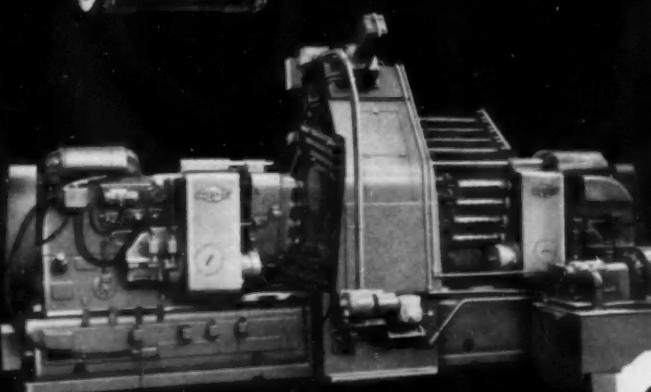
GREENLEE *special-purpose machines* for profitable mass production



Master brake cylinder
machined on above
Greenlee Special Machine.



Wheel cylinder machined on
Greenlee Special Machine
shown below.



WRITE FOR COMPLETE INFORMATION

THEY SAVE WORK...THEY SAVE MONEY

If you are being outdistanced in today's swift race for production...faced with narrowing profit margins...it will pay to investigate Greenlee Special Machines. Savings effected on drilling, reaming, boring, counterboring and tapping operations will quickly amortize your invested dollars.

(Above) Greenlee Horizontal Indexing Machine designed for processing master brake cylinders has proved itself with raised quality and lowered costs.

(Left) Greenlee Two-Way Horizontal Indexing Machine equipped with Power Clamping and Automatic Unloading increased previous production rates and lowered costs.

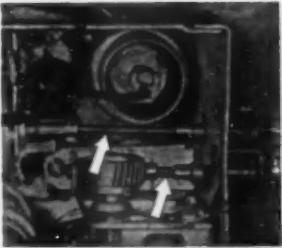


GREENLEE
BROS. & CO.
1755 MASON AVENUE
ROCKFORD, ILLINOIS

COST-SAVING IDEAS FOR DESIGN ENGINEERS

S. S. WHITE FLEXIBLE SHAFTS ELIMINATE ALIGNMENT AND VIBRATION PROBLEM

By coupling the tuning knobs to variable circuit elements with S.S. White remote control flexible shafts, the designer of the radio equipment illustrated was able to eliminate all problems of alignment and thus simplify assembly. The shafts also dampen vibration, preventing it from being carried to the sensitive parts of the circuit.



WHAT ABOUT YOU?

You'll find S.S. White remote control flexible shafts the answer to many similar design problems. It will pay you to investigate their possibilities in your own product. Our engineers stand ready to answer your questions. There's no obligation of course.

BULLETIN 5306 has basic information and data on flexible shaft application and selection. Send for a free copy. Address Dept. B



THE **S.S. White** INDUSTRIAL DIVISION
DENTAL MFG. CO.



10 East 40th Street
NEW YORK 16, N. Y.

Western District Office • Times Building, Long Beach, California

MEN in the NEWS

(Continued from page 102)

Lockheed Aircraft Corp.—G. A. Fitzpatrick has been named assistant general manager for the California Div.; John A. White, director of materiel; H. A. Caldwell, manufacturing manager; and Robert F. Hurt, chief tool engineer.

Pennsylvania Salt Mfg. Co., Industrial Chemicals Div.—Hugh C. Landis is now head.

Lincoln Electric Co.—L. K. Stringham was named vice-president in charge of engineering, and George Landis was appointed vice-president in charge of research.

Cummins Engine Co., Inc.—Loyd E. Williams has been promoted to manager of distribution.

Evans Products Co.—George M. Schueder has been appointed works manager in charge of production and engineering.

McCauley Industrial Corp.—Walter B. Voisard has been named sales and service manager.

Turner Brothers, Inc.—Charles C. Layman has been appointed vice-president of sales and engineering, and Stephen T. Moreland has been made director of engineering.

Cincinnati Gear Co.—Lester A. Edwards has been appointed sales manager.

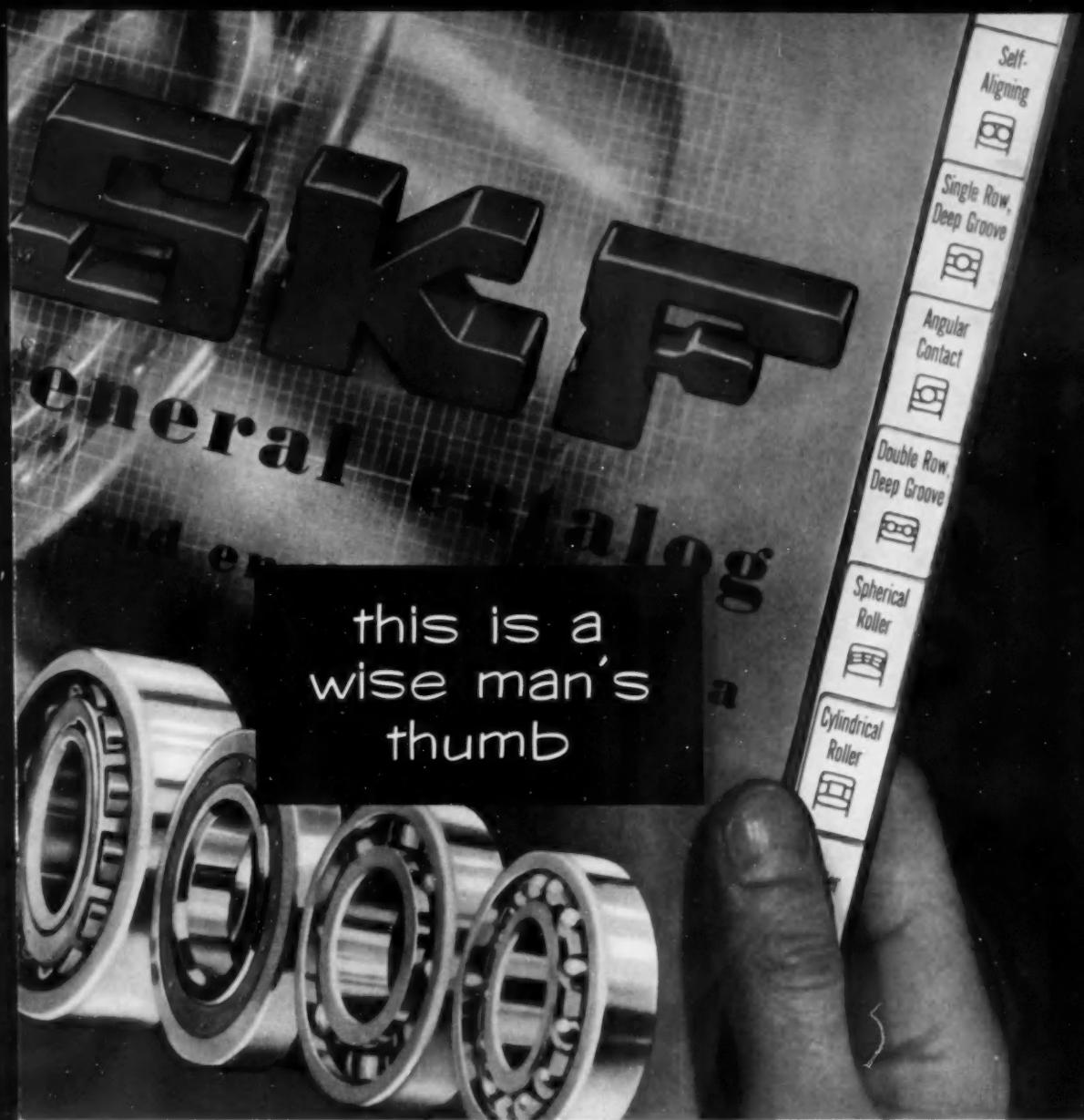
Fairchild Engine & Airplane Corp.—R. James Pfeiffer has been named executive director of customer relations.

AC Spark Plug Div., General Motors Corp.—Ian W. Beaton was named merchandising manager; David I. Barton, sales coordinator; and Ralph H. Weckler, distribution manager.

Reliance Electric & Engineering Co.—Richard A. Geuder has been appointed assistant general sales manager.

Joseph T. Ryerson & Son, Inc.—William G. Findlay is now manager of the Detroit steel service plant, and Francis B. Makens has become general superintendent of the Chicago plant.

Anderson Corp.—S. Malcolm Blanch was elected chairman of the board; Brent R. Anderson, president; and William C. Arthur, vice-president and assistant works manager.



The Design Engineer wants facts about bearings and, wisely, he starts his search in a catalog that covers both ball and roller bearings — the **SKF** catalog.

He knows some other things . . .

- that **SKF**'s field engineering staff, second to none in breadth of experience, has a man on call in *his area* . . .
- that **SKF**'s home office engineering staff has men who specialize on bearing applications in *his industry* . . .
- that **SKF**'s expanded laboratory can, if needed, perform special experimental work on *his problem* . . .

SKF — serving *all* industries — invests most heavily in bearing application service. By putting the right bearing in the right place, this service can help your product gain a competitive edge—through lower cost, longer life, reduced maintenance, and improved performance.

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.
— manufacturers of **SKF** and HESS-BRIGHT® bearings.



SKF
BALL AND ROLLER BEARINGS

© 1955 **SKF** Industries, Inc.

Bearings
the wise man
buys *



SKF EXCLUSIVE

For heavy duty service, the wise designer specifies this improved (Type "C") Spherical Roller Bearing. Only SKF makes it. Size for size, it provides up to 50% more capacity than other spherical roller bearings — vastly longer life for given radial and thrust load conditions.

SKF THRUST LOAD CARRIER

SKF's Spherical Roller Thrust Bearing is the wise designer's answer where the problem is to support heavy thrust loads, or combined loads which are predominantly thrust, on vertical or horizontal shafts. The only roller thrust bearing that is inherently self-aligning.



SKF STEELWORKER

For roll necks (and many other applications, too) the wise designer specifies SKF Multi-Row Cylindrical Roller Bearing, a design which provides the utmost in radial rigidity. In the larger sizes, SKF's hydraulic system makes mounting and dismounting easy.



SKF PROVED AND IMPROVED

The wise designer has long specified the proven SKF Triple-Seal "SAF" Pillow Block. The "SAF" is easy to install and inspect; effectively seals out dirt while retaining lubricant; bearing self-aligns. Now, to provide increased life and capacity, SKF makes the "SAF" available with the improved (Type "C") Spherical Roller Bearing. As a further improvement, the "SAF" can now be obtained with either cast iron or steel housing.

Let nearby SKF Field Engineers help you put the right bearing in the right place in your designs.
SKF INDUSTRIES, INC., PHILADELPHIA 32, PA. —
manufacturers of **SKF** and **HESS-BRIGHT®** bearings.



See idea for design engineers on other side.

SKF®

BALL AND ROLLER BEARINGS

© 1955 SKF Industries, Inc.

New Production EQUIPMENT

(Continued from page 87)

Pressure Switch

A gasket-mounted pressure switch has just been added to a line of oil-hydraulic equipment. It provides ease of installation and maintenance on



many types of industrial machinery. Series SG1-02 is offered in three models: 100 to 1000 psi, 100 to 2000 psi, and 500 to 5000 psi. Pressure settings are adjustable throughout each range. A special sub-plate is available for mounting where a machined pad is not provided. *Vickers, Inc.*

Circle 92 on postcard for more data

Variable Pumps

Two new series of high pressure, variable delivery hydraulic pumps are available: Series PVM-600 pumps are equipped with a handwheel control for manual adjustment of output; Series PVC-600 pumps incorporate a pressure compensated control for automatic regulation of pressure and flow.

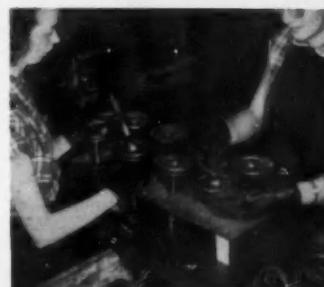
Generating continuous duty pressure up to 5000 psi, the pumps deliver 3.0 gpm at 1200 rpm; at maximum continuous speed of 2000 rpm, and full rated pressure, they deliver 4.0 gpm and provide over 11 hydraulic horsepower.

(Turn to page 142, please)

EASY-FLO and SIL-FOS will cut...

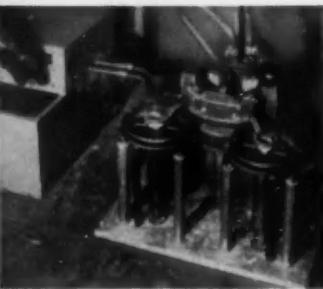


It's easy to cut costs on a wide variety of metal joining jobs with these low-temperature silver brazing alloys. Simply use a fast heating method and a setup that promotes fast handling of parts. In that way you get full benefit of the remarkably fast brazing of strong, virtually indestructible joints inherent in the exclusive composition and properties of EASY-FLO and SIL-FOS. Take this job for example — brazing one-piece stamped pulleys to shafts:



1 One girl slips pulleys onto shafts and applies HANDY FLUX. The other puts a ring of EASY-FLO 45 wire on top of each assembly.

Assemblies with preplaced alloy rings, are put in fixtures which accurately position pulleys, and are brazed automatically by induction heating.



2 Heating time for 2 assemblies is 25 seconds. Production per 8-hour shift is 1500. Assemblies are tested to 4000-lb. pull.

3 Photos and data courtesy of Zatko Metal Products Co., Euclid, Ohio



THE FULL STORY WILL CONVINCE YOU
It's all in words and pictures in BULLETIN 20 — including useful pointers on joint design and time-labor-cost-saving brazing production methods. Write today for a copy.



HANDY & HARMAN

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ENGINEERED for each engine
CALIBRATED to each engine
PRE-SET to a performance curve

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AFFECTED
BY...

...TEMPERATURE CHANGES
...HIGH OR LOW ALTITUDES
...CHANGING GAS PRESSURES

STARTS INSTANTLY in coldest weather.
 GIVES INSTANT power—no choking or fluttering.
 IDLES PERFECTLY in all conditions.
 BALANCES POWER of each cylinder.
 NO MULTIPLE ADJUSTMENTS—tune up only.
 PERFORMS AT ALL speeds to pre-set perfection.

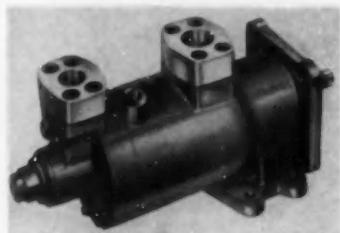
CENTURY GAS EQUIPMENT CO., 11188 Long Beach Blvd., Lynwood, Calif.

New Production EQUIPMENT

(Continued from page 141)

The pumps are of the axial piston type, with nine equally spaced pistons in a fixed cylinder block. They are not affected by variations in inlet pressure or fluid temperature and are self-priming and self-lubricating.

The manually controlled PVM models are recommended by the manufacturer as the source of high pres-



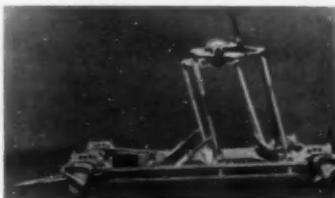
sure on high-low pressure systems for hydraulic presses, die-casting and plastic molding machines, closing and holding devices and machine tools.

The PVC models feature an integral pressure and flow regulator that automatically adjusts pump delivery to system requirements. When system pressure reaches the desired maximum, delivery is reduced to the minimum needed to maintain the pressure. Maximum pressure is maintained with low horsepower input. Ducedo Div., New York Air Brake Co.

Circle 93 on postcard for more data

Custom Lift

This price of ground handling equipment for aircraft and industrial use is said to be typical of what can



be made on a new production line. Using standard components the firm is now ready to mass produce lifts to customer's specification. H. W. Loud Machine Works, Inc.

Circle 94 on postcard for more data

COMPLETE Finishing SYSTEMS

... for ENAMELS • LACQUER • PAINT • VARNISH

Mahon Pressurized Tack-Off Enclosure. These are installed at the entrance end of Mahon Sealer Coat and Finish Coat Spray Booths.

Sealer Coat Tack-Off Enclosure and Spray Booth. Similar Final Color Coat Equipment at Right, with Wet Sand Deck between.

... the EXPERIENCE that goes
into the PLANNING and ENGINEERING
of MAHON EQUIPMENT is the item of
GREATEST VALUE to YOU!

Mahan Dry Sump, Down-Draft Hydro-Filter Spray Booth at Chrysler, Canada. These Booths are equipped with Paint Stripper for continuous cleaning of traveling grating in floor exhaust vents.

Mahan Automobile Body Finish Baking Ovens. These Ovens have multiple heat zones with automatic control for each zone.

Mahan Automobile Body Dry-Off Ovens—employed after Cleaning and Rust Proofing and after Wet Sanding operations.

Mahan Cooling Tunnel. These Cooling Tunnels reduce time-length requirements—permit more compact arrangement of equipment.

CANADIAN CHRYSLER BODIES are FINISHED in NEW, MODERN MAHON FINISHING SYSTEM!

Chrysler Corporation of Canada, Ltd., can today point to one of the world's most modern and most efficient automobile body finishing systems. In planning this installation, no detail was overlooked by Chrysler and Mahon engineers that would in any way add to operating efficiency or minimize maintenance and operating costs . . . many new features which make for long-range economy and contribute to better working conditions make their appearance for the first time in equipment of this type. If you have a finishing problem, or are considering new finishing equipment, you, like thousands of other manufacturers, will find that Mahon engineers are better qualified to advise you on both methods and equipment requirements . . . and better qualified to do the all-important planning and engineering of equipment—which is the key to fine finishes at minimum cost. You will find also, that Mahon equipment is built better for more economical operation over a longer period of time—a factor to be weighed carefully when comparing initial cost figures. Mahon will do your complete job on one contract . . . undivided responsibility for the entire system insures proper coordination and safeguards you against complications which may upset your production plans or subsequent schedules. See Mahon's Insert in Sweet's Plant Engineering File for information, or write for Catalog A-655.

T H E R. C. M A H O N C O M P A N Y

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Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning, Pickling, and Rust Proofing Equipment, Hydro-Filter Spray Booths, Dip and Flow Coaters, Filtered Air Supply Systems and Drying and Baking Ovens, Cooling Tunnels, Heat Treating and Quenching Equipment for Aluminum and Magnesium, and other Units of Special Production Equipment.

MAHON

Industrial Markets Expanding for Cut Felt Parts

BECAUSE they can be made to blueprint specifications, held to extremely close tolerances, and tailor-made to meet specified physical and chemical characteristics, new industrial markets are opening and swelling the annual consumption of cut felt parts. Cutting plants strategi-

cally located across the country report a growing demand for wool felt parts which are being turned out by the millions in many densities, thicknesses and qualities, according to The Felt Association, New York.

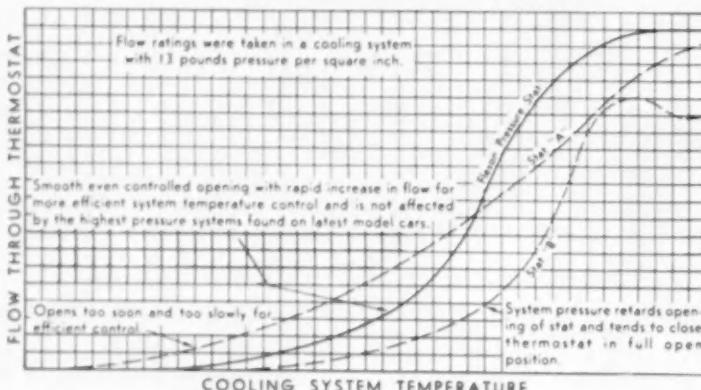
The many natural properties of wool fiber, such as compressional re-

siliency, high tensile strength, blendability, durability, excellent coefficient of friction, flexibility, and moldability, provide industry with a raw material which by itself or blended with other fibers to attain their specific properties can be processed to almost any consistency from gossamer softness to rock-hard density. The result of the felt maker's art is a product that is ideal for thousands of uses.

Because felt can be made to conform to a specific density and thickness, a specific resiliency, a specific shape, and maintain all of its properties over a wide range of operating conditions, it finds countless industrial, mechanical and engineering applications. To cite just a few examples, felt hard enough to whittle is used to polish glass and metal while grades soft enough to compact by hand are used for padding. Still other grades are used for frictional purposes, cushioning, wicking, filtering, insulation, and seals designed for particular applications are effectively used to keep lubricant in and foreign matter out of bearings.

Cut parts vary from washers smaller than a pinhead for use in precision instruments to thick pads several feet in diameter for heavy-duty use. They may be die-cut by the hundreds of thousands on automatic, high-speed presses or made by hand on special machinery. Unlike other products, these parts are ready for use immediately following the cutting process. Their efficiency in use and dependability is explained by the fact that from the raw material stage through the final cutting operation, every step in manufacture is carefully controlled, thus assuring the quality, uniformity and accuracy of every part made.

Here's Proof of the superior performance of Flexon Thermostats



Now you can have a thermostat that combines the proven advantages of a bellows type unit with the pressure compensating feature required in modern cooling systems. A new type of charge developed by Flexonics Corporation makes the difference.

The chart above shows the results of comparative tests of flow

characteristics made by an independent testing laboratory. As can be seen, the Flexon Thermostat has a smooth, even, controlled opening with a good flow characteristic in the operating range. This is the kind of thermostat performance required in modern engines to achieve more uniform motor temperature and more efficient cooling system operation.

These features coupled with such Flexon advantages as fail-safe operation and the integral stem guide make Flexon Thermostats the answer to today's demands for more efficient, more dependable cooling system control.

For further information, write, wire or phone.

Flexonics Corporation

Flexon identifies products of Flexonics Corporation that have served industry for over 33 years.



1396 S. THIRD AVENUE • MAYWOOD, ILLINOIS
FORMERLY CHICAGO METAL HOSE CORPORATION

Manufacturers of thermostats and flexible metal tubing.
Plants at Maywood, Elgin, Rock Falls and Savanna, Ill., and Memphis, Tenn.
In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

AUTOMOTIVE DIVISION

Recommended Uses for Standardized Felts

The Society of Automotive Engineers has established specifications that cover a sufficiently wide range of felts for nearly all mechanical uses and SAE designations are a good guide for selecting felts for cut parts. Some recommended uses are:

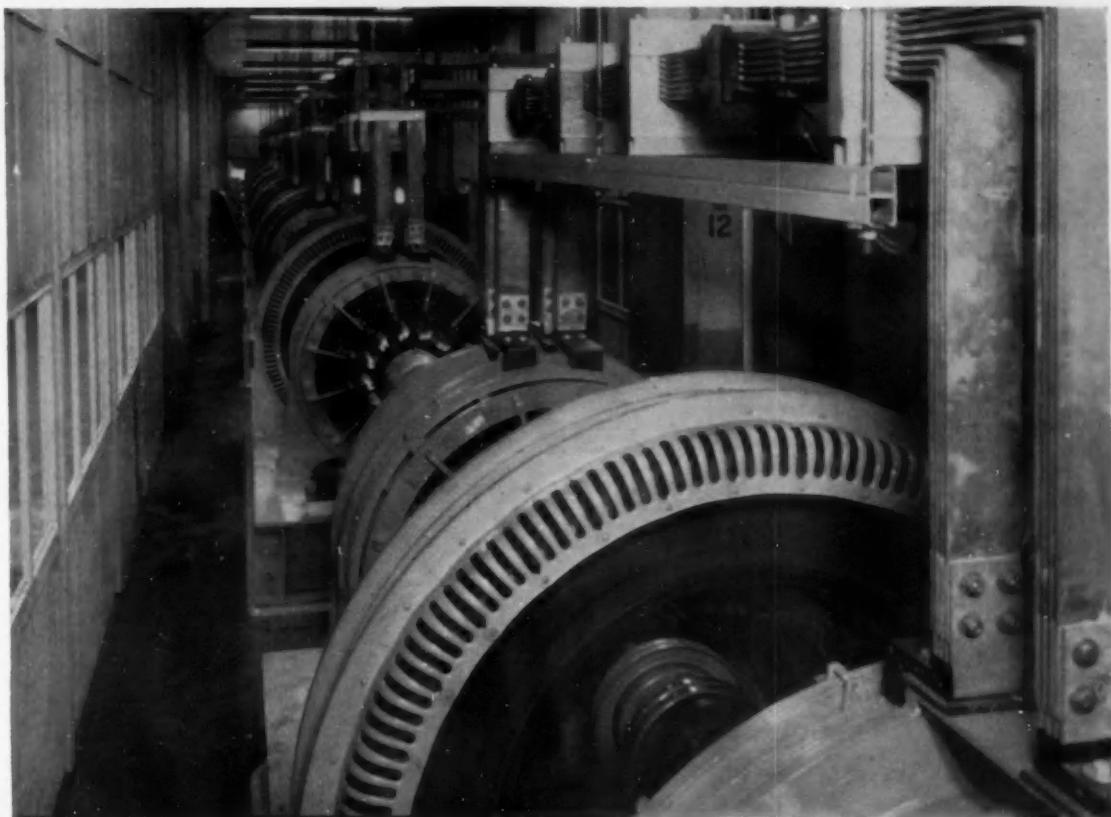
SAE F-1

For oil retention where the felt is not compressed, for feeding low viscosity or light oil, and where unusual strength and hardness are required. Washers, bushings, wicks, door bumpers, polishing blocks, and parts where wear and resistance to abrasion are required are typical uses.

(Turn to page 146, please)

625,000 Amps!

FOR THE WORLD'S LARGEST PLATING PLANT



One of 5 generator rooms

SUPPLIED BY 48

Chandeysson

ELECTROLYTIC
GENERATORS

YOU SAVE 4 WAYS...

USE LESS POWER ... precision-built for efficiency and built-in voltage regulation.

GET MORE OUT OF THE POWER YOU PAY FOR ... built-in high power factor at no extra cost.

ENJOY LIFETIME POWER DIVIDENDS ... sustained, lifetime overall constant efficiency as high as 85% does not decrease with age or overload.

BE SURE OF POWER WHEN YOU NEED IT MOST... Chandeysson users report capacity in excess of published statements of 150% momentary and 125% sustained loads, without distress or damage.

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WITH A

JONES TACHOMETER

TO CHECK SPEED PERIODICALLY
TO SHOW SPEED CONTINUOUSLY

Owners and operators of trucks, bulldozers, diggers, and other heavy equipment are using JONES TACHOMETERS to get

MAXIMUM PERFORMANCE and LONGER LIFE

from their heavy duty diesel and gasoline engines. There is a critical point at which an engine gives maximum performance without undue strain or smoking. That point is measured and checked in RPM's by JONES TACHOMETERS, designed for accuracy and shock resistance and preferred by the country's leading truck and engine manufacturers.

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Orchard VPI Paper gives off an invisible vapor that **STOPS RUST** on all ferrous metal parts. Economical for storage and for preserving shipments; saves rejections. **EASY TO USE**, eliminates need for preservative compounds and oils; the item can be reused immediately.



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Cut Felt Parts

(Continued from page 144)

SAE F-2, F-3

For same general uses as SAE F-1, but where a felt of slightly lower quality is satisfactory.

SAE F-5, 6, 7

For dust shields, wipers, grease retainer washers, wicks and uses where a resilient felt is indicated.

SAE F-10, 11, 12

For grease and oil retention where the felt is confined and compressed in assembly. Also for dust shields under operating conditions less severe than those requiring SAE F-5, F-6, and F-7 grades.

SAE F-13, 15

For sound deadening, chassis strips, spacers, dust shields, pedal pads, dash liners, and for mechanical purposes where abrasion and wear are not important factors.

SAE F-26

For packing, sound deadening or acoustical treatment.

SAE F-50

For ball and roller bearing oil retainer washers, small dust excluding washers, thin cut parts, gaskets and liners, and for mechanical purposes where close tolerances must be maintained and a thin, high-grade felt is required.

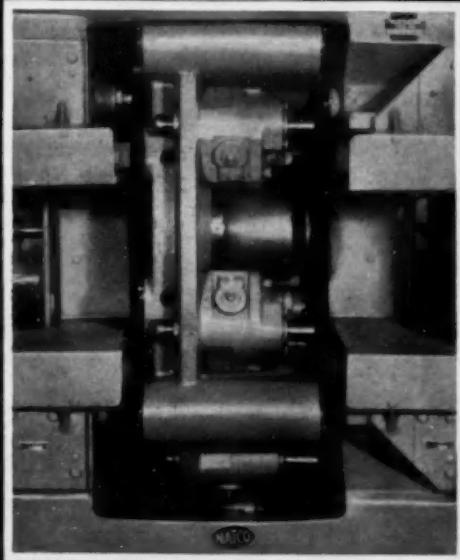
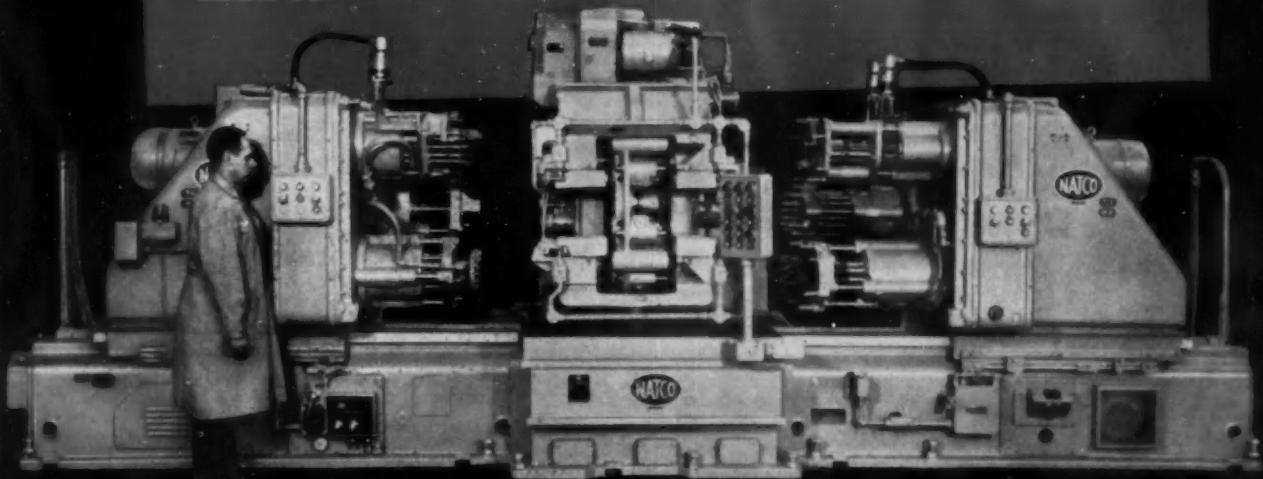
Methods of Cutting Felt Parts

Cut felt parts are prepared in a variety of ways and some of the methods used include die cutting, shearing, skiving, punching, drilling, channeling, extruding, grinding and carving. In addition, adhesives, impregnations, stitching and thermosetting also may be used to form quite intricate parts.

Die Cutting

In die cutting felt parts, presses ranging from 20 to 60-ton capacity are used. The dies may be made either of rule steel placed around a wood block, or a solid metal die made of tool steel machined to a specific shape. Just which type of die is used depends largely on the cutting machine. If the machine is of the dinker type, dies made of rule steel usually are used. On the other hand, if the cutting is done in a press, the die, usually made of tool steel, must be mounted on a die holder that goes up into the ram of the machine. In prac-

COMBINING OPERATIONS on a NATCO Cut Costs and Increased Production!



Close-up view of 6 position Trunnion Fixture

**109 REFRIGERATOR
COMPRESSOR
SHELLS PER HOUR**

Estimated Gross Production

DRILLED
COUNTERBORED
REAMED, TAPPED
CHAMFERED
BURRED



Total **77 OPERATIONS**

NATIONAL AUTOMATIC TOOL COMPANY, INC.
RICHMOND, INDIANA

for problems in Drilling, Boring, Facing and Tapping

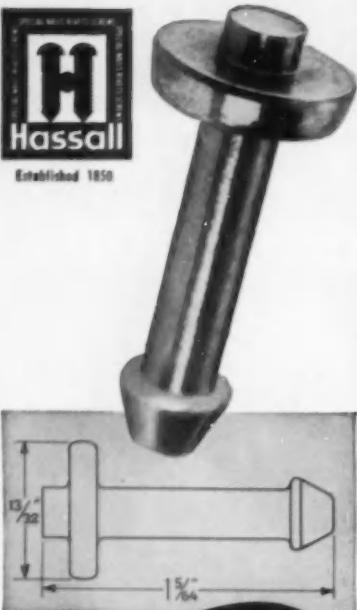
Call a Natco Field Engineer

CHICAGO, Room 203, 6429 W. North Ave., Oak Park
DETROIT, 10138 W. McNichols Rd.
BUFFALO, 1807 Elmwood Ave.
NEW YORK, 35 Beechwood Ave., Mount Vernon





Established 1850



SCREW MACHINE	\$14.00 per thousand
COLD HEADED	\$5.20 per thousand
SAVING	\$8.80 per thousand

How about your fasteners or small parts?
Have you had an estimate from HASSALL?

This is a typical example of how HASSALL saves thousands of dollars for cost-conscious manufacturers in hundreds of industries. This part is made in one piece by cold heading . . . the part is not only lower in cost but also stronger and just as accurate. Savings amount to \$8.80 per thousand and this manufacturer used hundreds of thousands a year!

Perhaps your parts can be made by this better, lower cost method. Send samples or sketches of your parts for a prompt, \$\$\$ saving quotation.

- Send for 3 color decimal equivalent wall chart.
- On request, our 36-page catalog.



**JOHN
HASSALL, INC.**

P. O. Box 2194 Westbury, Long Island, N. Y.

tice, rule steel dies are used for small quantity cutting. But regardless of the size of the run, if close tolerances are important in the finished part then steel precision dies are invariably used.

Shearing

In the manufacture of felt parts, shearing constitutes a guillotine type of cutting in which a supersharp blade cuts through one or more layers of felt simultaneously at a relatively high rate.

Skiving

Skiving of felt is done whenever it is necessary to maintain split hair thickness precision in cut parts. The skiving machine is capable of taking off hair thin sheets of felt from material and a common operation is to remove a layer of felt measured in thousandths of an inch.

Turning

In felt cutting plants, parts made of hard, firm, high density felts are produced by lathe-turning methods similar to those employed in the fabrication of metal and wood parts. The harder grades of felt, too dense to be cut by conventional cutting machines, call for the use of a high speed wood turning lathe for making polishing wheels, bobs, and grommets.

Punching

In many respects punching is similar to die cutting. However, in punching the die is used in a punch press and the process is known as a blanking operation, because the cutting is done against a flat surface. This type of cutting prevents a concave effect in the sides of the finished part. Punching, which can be done with a high degree of precision, invariably pro-

duces a straight wall on washers and other symmetrical felt parts and completely obviates bevelling.

Drilling

Drilling is employed in cases where the felt is too thick and too dense to be stamped or formed by other methods. It is a high-speed spinning operation performed on a drill press and in which special dies are used. Drilling maple-hard felts one inch or more thick (which ordinarily would split conventional punch dies) is sometimes done at speeds as high as 37,000 rpm to form roller bumpers, shock absorbers, etc.

Channelling

Sometimes also referred to as extruding, channelling is a cutting operation in which felt is fed into a machine fitted with spinning dies which cut felt into strips, round, half-round, oval, or square.

Carving and other techniques

Formed parts having undercut contours are shaped in some instances by carving dense grades of felt, sometimes by laminating several flat shapes by means of stitching or adhesives. Besides being turned and drilled mechanically, very hard sheet felts also may be sculptured for special purposes.

In still other operations, impregnations are used to effect rubber-to-felt bonding for oil seals. Impregnations, saturants, and special treatments are not uncommon to impart special properties to cut felt parts. A new and important method of making cut felt parts involves themosetting techniques in which heat and pressure are utilized to shape moulded parts.

LITERATURE

SYMPOSIUM ON EFFECT OF TEMPERATURE ON THE BRITTLE BEHAVIOR OF METALS WITH PARTICULAR REFERENCE TO LOW TEMPERATURES, published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price \$7.50. This book deals with the brittle behavior of metals at low temperatures. It will be useful to designers, engineers, and metallurgists in practically all branches of engineering in making them more fully cognizant of the joint role played by metallurgical and mechanical factors and their influence on the behavior of metals at low temperatures. It will be of particular value to fabricators of chemical equipment to be operated at low temperatures; fabricators or operators of pipelines for transmission of natural gas; fabricators of large welded structures such as bridges, storage tanks, or ships; steel companies engaged in the production of steel; and foundries producing castings for refrigerators and equipment operated at low temperatures.

STANDARD METAL DIRECTORY, published by the Bardeen Press, Inc., 425 West 25th St., New York, N. Y. Price, \$15.00. The 1954 edition of this book has been enlarged, completely revised, and two new important features added. The directory is divided into four sections: iron and steel plants; ferrous and non-ferrous metal foundries; metal rolling mills; smelters of non-ferrous metals. It contains more than 10,000 detailed reports on steel mills, foundries, smelters, rolling mills and non-ferrous metal plants located in the U. S. and in Canada. The plants are listed geographically and alphabetically. The reports give the name of the company, its capitalization, plant equipment, products manufactured, primary and secondary raw materials consumed, names of company officials, purchasing agent, and sales manager. The two new features that have been added are a list of distributors of non-ferrous metal products throughout the U. S. and Canada, and a list of smelters and refiners of non-ferrous metals throughout Europe.

Young Heat Transfer News

YOUNG RADIATOR COMPANY, RACINE, WIS.

Navy Selects Young Engine Cooling Radiators for Mobile Jet Starters



These three methods are:
(a) conduction, (b) convection and (c) radiation.

Heat transfer by conduction exists when heat flows within a body from one region of high temperature to another region of lower temperature by simple molecular communication. The amount of heat which can be transferred by conduction is dependent on the temperature difference, thermal conductivity of the material through which the heat is being conducted, the distance between the hot source and the cold sink, and the cross sectional area for heat flow.

Transfer of heat by forced convection depends on the velocity of the fluids over the surface through which heat is conducted . . . by the shape of the surface, by the area through which heat is conducted . . . and by various properties of the fluid as well as temperature difference.

The third general means of heat transfer is radiation. Here heat flows from the body of the higher temperature to the body of the lower temperature through space without any medium within the space. For further details on this subject write for free bulletin: "Heat: Forced Convection Removal From Industrial Hydraulic Circuits" to Young Radiator Company, Dept. 105-E, Racine, Wis.



NEW FIXED TUBE BUNDLE HEAT EXCHANGER CATALOG

A complete description of stock and specially engineered Young Radiator Company Type "F" Fixed Tube Bundle Heat Exchangers is given in the newly revised Catalog No. 2154. For your copy, write Dept. 105-E, Young Radiator Company, Racine, Wis.



NC-5 Self-Propelled Power Plant

NC-5 Self-Propelled Power Plants are being built for the United States Navy and United States Air Force by prime contractor Consolidated Diesel Electric Corporation, Stamford, Connecticut. The vehicle is used to supply electric current for starting, towing and servicing Navy and Air Force jet planes. Its maneuverability, flexibility and speed of starting or servicing a line of planes offers many advantages over stationary or trailer types of power equipment.

Young Radiator Company fabricated Radiators for cooling the engines of these highly-specialized vehicles.

Radiator design was important because the vehicle's engine drives the 37 kw generating unit while the vehicle is at rest. The Young Radiator is constructed as an extra rugged unit with



Rear view Young Radiator used on Navy vehicle

copper fin and tube core, drawn brass top and bottom tanks, and sturdy sheet metal reinforcing side members.

For further details on Young Radiators write Young Radiator Company, Dept. 105-E, Racine, Wisconsin.



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Creative HEAT TRANSFER ENGINEERS FOR INDUSTRY
Heat Transfer Products for Automotive, Heating, Cooling, Air Conditioning Products
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Oldsmobile
Wynnewood, Pa.

"My customers take performance for granted when they're buying an Oldsmobile. What they are looking for is style and beauty. They get that—plus performance—when they choose one of the models upholstered in genuine leather. Leather is not only stronger, longer-lasting, and easier to care for—it is also the top of upholstery style."

Impartial tests back up what Mr. Scott says. Genuine leather upholstery is 77% stronger than the next-best upholstery material.

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Mergers and the Monopoly Myth in the Automotive Industry

(Continued from page 50)

for the last time in 1920. He organized Durant Motors Inc. in 1921, a firm which disappeared at the onset of the depression.

Durant, in stating his reasons for amalgamation, declared:

"How could I tell what these engineers would say next? . . . I was for getting every kind of thing in sight, playing safe all along the line."⁴

The industry was changing so rapidly that Durant bought as insurance, and many purchases were expensive. There was no avowed aim to monopolize the industry nor was it considered possible.

Benjamin Briscoe, with Eastern banking support, founded the United States Motor Co. in 1910 as a combination of Maxwell-Briscoe Co., Columbia Motor Car Co., Dayton Motor Car Co., Brush Runabout Co., Alden Thomas Manufacturing Co. and Courier Motor Car Co. The firm failed two and a half years later. William Flanders took the company in receivership and combined it with the Flanders Motor Co. The resulting firm in turn disappeared via bankruptcy and from its ashes emerged the Maxwell Motor Co., Inc. in 1913. This firm merged with Chalmers Motor Corp. in 1919. In 1921 the Maxwell Motor Corp. was formed uniting the Maxwell Motor Co., Inc. and the Chalmers Motor Corp. under the direction of Walter P. Chrysler. Chrysler had been associated with Durant in Buick and then had managed the Willys-Overland Co. In 1925 the Chrysler Corp. was formed to acquire the assets of the Maxwell Motor Corp. In 1928 it acquired Dodge Brothers, Inc.

Briscoe, in commenting on mergers in the automobile industry, stated that they didn't have as their purpose to monopolize the industry. It was not considered possible. Mergers arose from the weakness of the industry. Behind every merger was the hope of raising capital and the mergers that took place did not result in any monopoly positions.

Part II of this article will appear in an early issue of AUTOMOTIVE INDUSTRIES.

⁴ Epstein, Ralph Cecil. *The Automobile Industry, Its Economic and Commercial Development*. Chicago: A. W. Shaw and Co., 1928, p. 183.

YOURS FOR THE ASKING . . .

the **ALL-NEW AUTOMOTIVE INDUSTRIES** **EDITORIAL INDEX (Vol. 111)**

covering the issues from July 1 to December 15, 1954, inclusive

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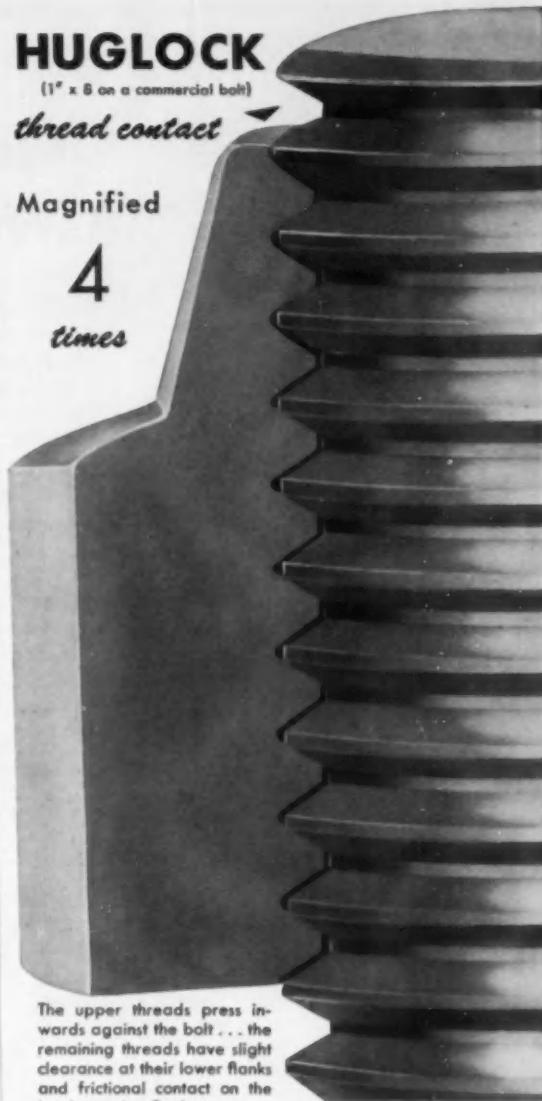
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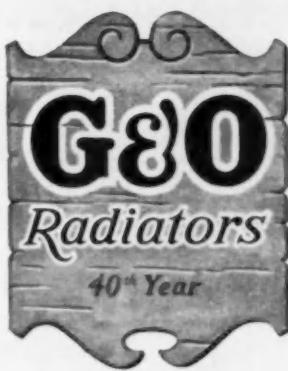
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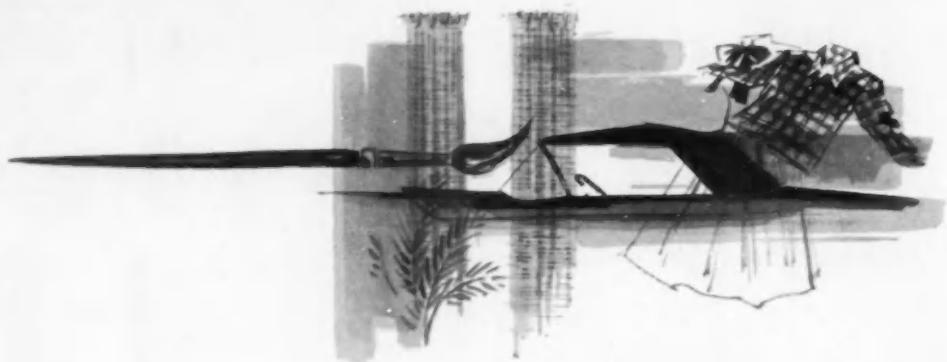
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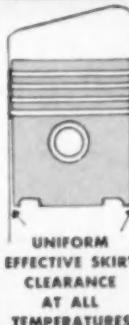
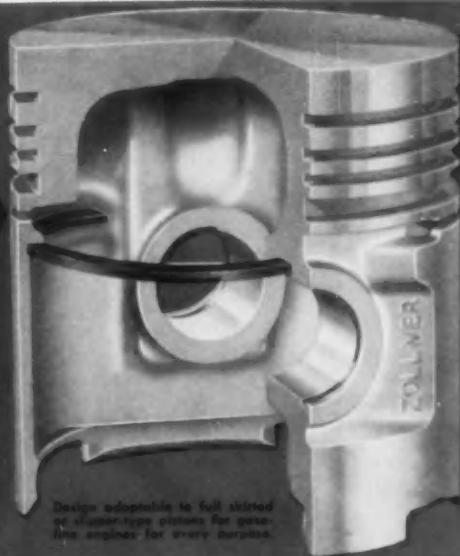
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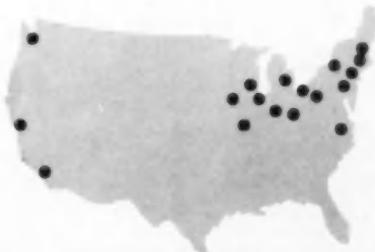
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